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PROCEEDINGS *of the* ROYAL SOCIETY OF MEDICINE

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Clinical Section

President—Duncan Fitzwilliams, C.M.G., F.R.C.S.

[*November* 11, 1938]

Eight Cases shown by Cecil Joll, M.S.

I.—Complete Gastrectomy for Carcinoma

J. K., female, aged 42. Admitted 6.8.38.

History.—In May 1938 there was a sudden onset of epigastric discomfort and occasional pain, relieved by food, drink, and alkaline powders. Symptoms were worse seven weeks ago; there were attacks of sickness, and the vomit was occasionally blood-stained. Lost 12 lb. in weight.

On examination.—Irregular mass in epigastrium 2 in. below xiphisternum. Visible peristalsis in epigastric region. Dull on percussion over mass. No palpable glands. *Per rectum* no appreciable disease.

Skiagrams: Barium meals. (1) 16.6.38: Duodenal cap normal. Gastric ulcer present. (2) 20.7.38: Appearance strongly in favour of rapidly advancing neoplasm.

Blood-count, 25.7.38: Hb. 68%. 8.8.38: Hb. 70%.

Treatment.—8.8.38: Total gastrectomy.

Pathological report: A "leather-bottle", or diffuse, type of carcinoma of the stomach extending from the œsophageal opening to the pylorus and involving the whole of the lesser curvature. Microscopically the malignant cells are irregularly scattered through the stomach wall and associated with generalized fibrosis.

Condition on discharge, 30.8.38.—Satisfactory.

Mr. Joll said the interest of this case lay in the relatively recent onset of symptoms, the comparative ease with which the operation was completed, and the slight reaction which followed. Complete gastrectomy was no longer a rare procedure and could be justified, in spite of its high primary mortality, by the fact that survivals up to five years or more had been recorded. In his own series of over a dozen total gastrectomies one patient lived three years and two months and was able, just as the patient shown to-day, to take ordinary food in surprisingly large amounts. Serious anæmia did not, in his experience, always follow the operation.

II.—Carcinoma of Colon with Gastro-colic Fistula

A. K., female, aged 66. Admitted 12.9.38.

History.—Six weeks ago sudden attack of vomiting of brownish foul-smelling material. Three attacks since.

Investigations.—X-rays show constant filling defect. Appearances those of a growth arising either from the stomach or more probably from the colon invading the former.

Heart: Blood-pressure 160/80. Apical systolic murmur.

Test meal: Hyperchlorhydria. Blood in all specimens.

Blood-count: R.B.C. 3,660,000; Hb. 58%; C.I. 0·81; W.B.C. 12,200 (Group III). 14.9.38: Hb. 76%.

Treatment.—Partial gastrectomy, resection of transverse colon, end-to-end anastomosis, cæcostomy in one stage.

Pathological report: Columnar type adenocarcinoma.

Condition on discharge, 17.10.38.—Good.

Mr. Joll said gastro-colic fistulæ were more commonly consequences of neoplasms of the colon invading the stomach than vice versa. Such cases were not very suitable for two-stage operations and, whenever it was possible to prepare the patient adequately, the operation which he had carried out, followed immediately by cæcostomy to act as a safety-valve, seemed to him the best procedure in a difficult type of case.

III.—Sarcoma of Humerus

W. B., aged 28, engineer's fitter.

22.1.31 : Admitted to hospital.

History.—Aching pain in left shoulder of three months' duration. Small swelling upper part left arm which has gradually increased in size ; first noticed six weeks ago.

On examination.—Swelling, size of orange, upper third left arm, smooth and apparently involving bone. Egg-shell crackling, but no attachment to skin.

Investigation.—Skiagram left arm ; extensive tumour involving upper half of left humerus. Expansion of bone with trabeculation. X-ray appearances of sarcoma.

Treatment.—29.1.31–23.2.31 : H.V. therapy to tumour 4,600 r—no improvement. 25.1.31 : Disarticulation through shoulder-joint.

Histological report : Myxo-chondro-sarcoma.

2.4.31 : Discharged from hospital.

After-history.—November 1937 : No sign of recurrence.

Mr. JOLL said that survival of nearly eight years after disarticulation at the shoulder-joint for sarcoma of the upper end of the humerus was unusual, if not exactly a rarity. Undoubtedly the malignancy of myxo-chondro-sarcoma was less than that of the sarcomata with numerous anaplastic cells.

IV.—Sarcoma of Clavicle

F. S., male, aged 48 ; civil servant. Admitted to hospital 12.2.33.

History.—November 1929 thrown off bicycle. One month later noticed swelling left shoulder region—gradual increase in size.

On examination.—Nodular tumour 3 in. by 2 in. by 1½ in. replacing outer half of left clavicle. No adhesion to skin.

Investigation.—Skiagram of left clavicle : Tumour had the appearance of an enchondroma.

Treatment.—15.2.33 : Excision of outer half of left clavicle and overlying structures.

Histological report : Chondro-sarcoma.

After-history.—November 1938 : No sign of recurrence.

Mr. JOLL said the traumatic factor in this case could not be ignored since the tumour appeared so soon after the injury. The malignancy in this case, as in the preceding one, must be taken to be of a lower degree than in most bone sarcomata.

V.—Carcinoma of Stomach

A. M., female, aged 65.

30.5.29 : Admitted to hospital.

History.—For six months has vomited two or three times a week, occasionally after meals. Flatulence, epigastric discomfort, and poor appetite. Loss of weight, 1½ st.

On examination.—Abdomen : No apparent disease.

Investigations.—Skiagrams showed marked delay in emptying the stomach and irregularity of pre-pyloric region. Test meal : High total acidity suggesting pyloric obstruction.

Treatment.—7.6.29 : Partial gastrectomy.

Histological report : Spheroidal carcinoma.

After-history.—October 1938 : No sign of recurrence.

Mr. JOLL said that a survival of over nine years after gastrectomy for carcinoma of the stomach was unusual and was to be expected only when, as in this case, the growth, early in its progress, produced obstructive symptoms which necessitated operative treatment. It was significant the test meal revealed a high acidity and this, coupled with the inconclusive radiological evidence, was interpreted incorrectly as indicating an innocent stricture. In his experience at least 5%

of pyloric neoplasms were associated with hyperchlorhydria, and the latter feature should not be allowed to influence one against a diagnosis of carcinoma, especially when the history of the illness in an elderly patient was comparatively short.

VI.—General Osteitis Fibrosa : Parathyroidectomy

L. L., female, aged 24.

History.—In 1928, when patient was 14, she had swelling of the knee-joints and bending of the bones in their neighbourhood. No treatment : Normal stature. No symptoms other than " knock-knee " until October 1936 ; then dull aching pain developed in the left knee, localized to the left thigh. Three weeks after the onset of pain, she fell when getting out of bed and fractured the right humerus and left femur. The fractures were slow in healing but united, the patient says, without deformity. Treatment lasted twelve months.

Investigations.—6.11.36 : X-rays showed fracture of mid-shaft of femur. Slight backward displacement. Fracture in lower third of humerus. Considerable backward angulation. Marked decalcification of femur, humerus, and upper parts of radius and ulna. ? osteomalacia.

1.12.36 : No evidence of bony union. Practically no calcium in bones. 5 c.c. collosal calcium given intramuscularly 11.12.36 and 14.12.36.

16.12.36 : Skiagrams of pelvis, vertebral column, ribs, and skull showed extensive bony changes throughout the skeleton, very marked in pelvis and skull. Not Paget's disease, although distribution was similar. 18.12.36 : Serum calcium 18 mgm. per 100 c.c. Wassermann reaction negative. Blood urea 80 mgm. %. 19 and 22.12.36 : 5 c.c. collosol calcium intramuscularly. 13.1.37 : No callus visible in leg. Possibly very slight bony union of humerus. 2.3.37 : Union appears sound in humerus but there is marked decalcification. Femur does not appear to be soundly united. 29.1.37 : Serum calcium 15 mgm. per 100 c.c. Blood urea 10 mgm. per 100 c.c. Urine—a minute trace of albumin.

Patient went home for four months ; in February 1938 caught heel on stairs and fell down four steps, re-fracturing right humerus and femur. Back to hospital for two weeks, on weight extension, then transferred to convalescent home for some weeks on a Thomas' splint only.

Before admission to Royal Free Hospital the patient was in bed for a few weeks without splinting, and deformity of the left leg gradually developed during this period. No time during the last two years has there been bone pain. Patient has good appetite, but during the last three months has had periodic attacks of cramp-like central abdominal pain. Thirst and polydipsia for past eighteen months. No polyuria. No hæmaturia or renal colic. Easily fatigued.

Menstrual history : Onset of catamenia at 17 : periods 4–5/28.

Previous illnesses : None other than " bending of bones " at 14.

Family history.—Four siblings—one brother and three step sisters—all healthy. Mother healthy. Father killed in Great War. No history of fractures or deformities. No deafness. No eye defects.

On examination.—Pallid ; slightly built ; height 4½ ft.; well covered.

Skull : Globular, with prominent frontal and parietal eminences. Percussion normal. Teeth fair ; marked pyorrhœa ; spongy gums.

Trunk : Marked kyphoscoliosis to right. Not correctable. Sternum and ribs normal.

Upper limbs : Right and left humerus 11 in. ; equal ; no deformity ; bones feel larger than normal. No palpable cysts or tumours. Forearms 9 in. ; equal. Prominent interphalangeal joints. Both little fingers flexed at proximal interphalangeal joints. No shortening and broadening of terminal phalanges. Lower limbs : Marked external angular deformity of upper third left femur. Left femur 13½ in. Right femur 17 in. Marked genu varum both knees. Tibiæ equal length ;

rather rounded anterior borders. No tumours or cysts palpable. No tenderness of bones on palpation. Musculature hypotonic. No palpable tumour in neck.

X-rays show generalized osteitis fibrosa with multiple cysts.

Blood-calcium 16·4 mgm. per 100 c.c. controlled.
Blood-calcium 13·9 mgm. per 100 c.c. controlled.
After four days on low calcium diet.
Blood-calcium two days after operation 8·25 mgm. Control 10 mgm.%.
Blood-calcium seven weeks after operation 8·2 mgm. Control 10 mgm.%.

Blood-phosphorus 2·9.

Blood-phosphatase 27·2 units (King). Normal 3–13.

Calcium balance: Urinary output 200 mgm. per day approximately on calcium low diet. Approximate intake 100 mgm. per day.
10.11.38: Calcium balance is at present being estimated. Figures are approximately normal.

Operation.—12.9.38: Removal of right lower parathyroid, which was the seat of an adenoma 3 by 1·3 by 0·7 cm. and weighed 1·35 grm.
Pathological report: Parathyroid adenoma.
Progress.—Pathological fracture of right femur on day after operation; occurred while bed-pan was being given. Positive Chvostek's and Trousseau's signs for some days after operation.

Mr. JOLL said this case, which might be said to be a "typical" example of von Recklinghausen's disease of bone, illustrated very well the fact that the size of the parathyroid tumour bore no relation to the severity of the bony lesions. Actually the only surgical difficulty of the case was the similarity of the parathyroid to the adjacent thyroid tissue, from which, however, it was in fact separated by a distinct yet tenuous capsule of its own. The parathyroid corresponded in position to the right inferior glandule in a normal case.

VII.—Intrathoracic Goitre

M. D., aged 35. Admitted 18.10.38.
History.—Breathlessness first began during pregnancy four and a half years ago. Thyroid swelling noticed one year ago; treated by medication. Patient now seven months pregnant. Last few months excessive breathlessness, headaches, palpitations, and insomnia.
On examination.—Dyspnœa, even at rest. Moist skin. Venous enlargement of head and upper part of trunk. Large nodular enlargement of the thyroid gland. Right lobe larger than left. Mass extends into thorax from left side. Area of dullness on right side behind sternum and 1st and 2nd costal cartilages.
Skiagram: Large intrathoracic extension on right side extending 2 in. below top of sternum. Larynx: Cords normal. Electrocardiogram: Normal. B.M.R. + 16. (normal value in pregnancy.)
Treatment.—24.10.38: Partial thyroidectomy.
Operative findings.—Large intrathoracic goitre, intrathoracic portion arising from left lobe, passing behind trachea to lie in right side of chest.
Pathological report: Colloid nodular goitre. Weight $4\frac{7}{8}$ ounces (cervical part $2\frac{1}{2}$ ounces, thoracic part $2\frac{3}{8}$ ounces).
Condition on discharge, 4.11.38.—Satisfactory.

Mr. JOLL said that this was the only example he had so far met with, of a right-sided intrathoracic goitre being connected with, and vascularized from, the left lobe of the thyroid gland. Such a circumstance might easily result in the condition being altogether overlooked at operation unless both lower lobes of the gland were systematically dislocated and examined. Another unusual feature was that the connecting mass between the cervical and thoracic portions passed behind the trachea and in front of the œsophagus.

VIII.—**Lobectomy for Bronchiectasis**

D. D., female, aged 14. Admitted 13.7.37.

History.—Cough and offensive sputum since pertussis at the age of 3.

Investigations.—Chest : Signs suggestive of bronchiectasis. X-rays after lipiodol show tubular bronchiectatic condition at left base.

Treatment.—29.7.37 : Lobectomy.

Pathological report : Secondary bronchiectasis.

Condition on discharge, 20.8.37.—Excellent ; wound soundly healed. 11.11.38 : Very well.

Mr. JOLL said that this case showed how very trivial was the permanent deformity of the chest and spine after lobectomy for bronchiectasis in a child. The patient was in robust health, there was no appreciable scoliosis, and the expansion of the chest on the affected side was remarkably good.

Partial Blindness, with other Neurological Signs, cured by Cervico-dorsal Sympathectomy.—K. REED HILL, M.D., and LAWRENCE ABEL, M.S.

Mr. A. W., aged 34.

History.—In 1925 the patient began to have severe headaches accompanied by spells of depression.

In 1928 the headaches became localized to the left side and around the left eye. Attacks of giddiness and vomiting occurred and there were periods of unconsciousness, and a marked intention tremor of the right upper extremity. In January 1930 he had an acute left frontal sinusitis ; the sinus was drained by Mr. Aldington Gibb, and after the operation the attacks of sickness ceased but tremors of the right hand continued. In April 1930 the pains in the head and the attacks of uncon

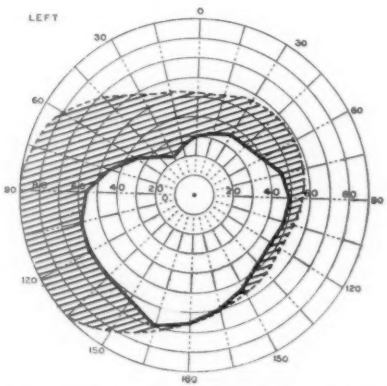


FIG. 1.—11.3.35. White 5/330 (artificial light).

sciousness returned. In May 1930, and again in 1931, the left ethmoidal cells were opened by Mr. Aldington Gibb.

In 1932 the patient had severe and continuous fits of depression and the pain in the head became almost unendurable. Some improvement followed lumbar punctures and exploration of the sphenoidal sinuses.

In February 1935 he came under ophthalmic observation by one of us [K.R.H.] on account of deterioration of vision of the left eye. Visual acuity in this eye was $\frac{6}{60}$; the disc was pale and the retinal arteries and the field of vision)11.3.35) were constricted. (Fig. 1.)

When the patient was seen again, in February 1936, the vision of the left eye had

diminished to ability to count fingers at a distance of a metre; the right vision was $\frac{6}{4}$. The field of vision of the left eye had become still more constricted (fig. 2). The patient complained of slight deafness in the left ear and continual headaches and depression; and there was still a marked intention tremor in the right hand. He had been unable to do any work for the past eight years. We decided that the most likely cause of the symptoms was a sympathetic dysfunction, and after consultation with the patient's own practitioner (Dr. Wilson of Sittingbourne), it was decided to perform a sympathectomy.

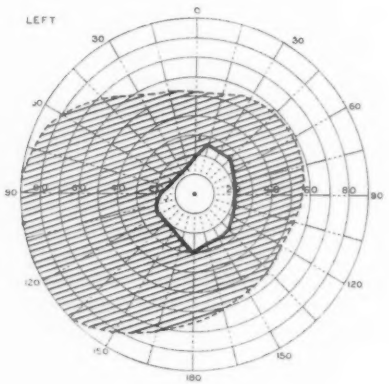


FIG. 2.—5.3.36

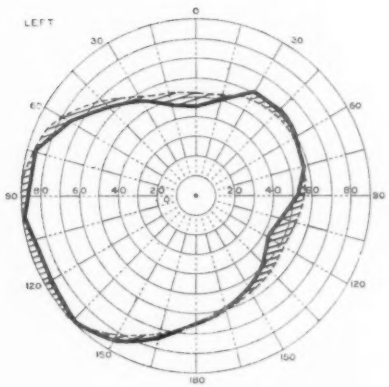


FIG. 3.—8.6.36.

In April 1936 the left stellate ganglion was removed [by L. A.] and a typical Horner's syndrome followed.

In June 1936 a slight left ptosis was present and the ear and hand on the left side were warmer than on the right. The visual acuity of the left eye was $\frac{6}{4}$, and the field of vision was full (fig. 3). No pathological scotoma was present and the intention tremor of the right hand had entirely disappeared. The giddiness and depression

had ceased, and the pains in his head had also practically disappeared. The discharge from the nose, which had been continuous for several years, had also ceased, and the patient returned to work. For the period (two years and a half) since then he has been entirely free from symptoms, and has worked continuously and energetically, and maintained an entirely normal outlook on life.

Splenomegaly : ? Nature.—THOMAS HUNT, D.M., F.R.C.P.

H. T., aged 49, chauffeur.

First noticed swollen gland in neck during October 1937. Attended hospital December 1937. Biopsy of gland : reported as sarcoma. Spleen reported not enlarged. January 1938 : Eleven teeth extracted. March 1938 : Herpes zoster left leg. April 1938 : Abdominal distension, loss of weight, and weakness.

Past history.—Served in India, Gallipoli, and Egypt, in the Great War ; malaria 1917.

First seen May 1938. Marked anæmia ; spleen greatly enlarged ; very weak ; no glandular enlargement. Repeated blood-counts at this time showed R.B.C. varying between 2,500,000 and 3,400,000 : size 6·8 to 7·4 μ ; W.B.C. 2,400 to 1,500 ; polymorphonuclear neutrophils 82–59% ; lymphos. 18–34%. Blood Wassermann reaction negative. Fragility of red cells : Slight hæmolysis 0·400% saline ; complete hæmolysis 0·350%. Temperature variable, at times rising to 101°. Blood culture sterile.

Sternal puncture : Examination of marrow suggested a normal white cell picture with hyperplasia of the red-cell-forming marrow. No treatment (blood transfusion, iron, ultra-violet light) appeared to influence the condition appreciably.

Lævulose tolerance test (29.6.38) :—

Hours after 50 grm. lævulose ..	0	½	1	1½
Blood-sugar (mgm.)	90	115	125	110

August 1938 : Slight ascites and jaundice appeared.

Blood-count (3.8.38) : R.B.C. 2,000,000 ; Hb. 36% ; W.B.C. 800. *Differential :* Polys. 70% ; lymphos. 20% ; monos. 10%.

August 12, 1938 : Splenectomy successfully carried out by Mr. A. D. Wright. Moderate ascites present : a few small white nodules seen in omentum and mesentery. Liver appeared normal.

The spleen weighed 2,250 grm. (5 lb. 10 oz.) ; appearance uniform ; dark ; no macroscopic evidence of increased fibrosis or siderotic nodules.

Histological report (Prof. D. Newcomb) : Condition appears to be that of megakaryocytic myelosis.

Since the operation patient has gained 3 st. in weight. Blood-count (18.10.38) : R.B.C. 4,300,000 ; Hb. 75% ; W.B.C. 15,700. *Differential :* Polys. 51% ; lymphos. 29% ; monos. 19%.

October 5, 1938 : Gradual onset of left hemiplegia ; now almost disappeared ; regarded as due to cerebral thrombosis.

The diagnosis suggested is that of megakaryocytic myelosis : alternative possibilities are lymphatic leukæmia, splenic anæmia, lymphosarcoma. The rapid enlargement of the spleen, signs of hepatic involvement, leucopenia, and the remarkable change in blood picture and clinical condition since splenectomy are points of special interest.

Dr. F. PARKES WEBER said he did not think the case could be one of myelosis or any variety of leukæmia. Splenectomy had been performed in quite a number of leukæmic cases, either because of a mistaken diagnosis or in the hope of some benefit, but in no case had a satisfactory result, comparable to the present one, been obtained. He suggested that this case really belonged to the broad reticulosis class, though obviously an extremely rare type.

Purpura and Angioneurotic Œdema in a Male, associated with Hypertrophy of the Breasts.—R. S. BRUCE PEARSON, D.M. (by courtesy of Sir Arthur Hurst, D.M.)

F. H., aged 48 years. Has always lived an active life; in his youth he was a professional football player.

In 1928 he first complained of swelling of the back of the hands. This would develop slowly over several hours, and was always worse if he had been using his hands, e.g. in digging or playing cricket. During the past three years there have been, in addition, hæmorrhagic lesions of the skin, slightly raised and several centimetres in diameter. These also develop slowly, chiefly on the arms, thighs, and face, and often assume an iris form; they may be associated with swelling of the underlying tissues or may occur apart from this. The mucous membranes of the mouth are sometimes involved.

In 1936 the patient coughed up small quantities of blood on several occasions, and at other times he has had colicky abdominal pain suggestive of intestinal hæmorrhage or œdema. He also complains of intermittent swellings of the breasts, which remain definitely enlarged between attacks. In 1936 his penis was amputated, probably for epithelioma. There has been no evidence of recurrence of the growth.

On examination.—Spleen palpable.

Blood: Bleeding time 2 min. 15 sec. Clotting time 1 min. 12 sec. Hb. 72%; R.B.C. 3,600,000; W.B.C. 5,500. Platelets 257,730. Test meal shows achlorhydria.

Dr. PARKES WEBER suggested a prolonged trial of intravenous calcium therapy.

Two Cases of Dislocation of the Cervical Spine in Children Caused by Hyperæmic Decalcification of the Vertebræ following Cervical Adenitis.—DAVID LEVI, M.S.

I.—Raymond K., aged 1 year and 9 months, first seen on July 4, 1938.

History.—Had a cold one month before admission. He had fallen from his mother's knee while sitting on the beach, and a few hours afterwards complained of pain in the back. This pain was very marked for two weeks, but was better for a fortnight before admission. X-rays showed dislocation of C 2 and C 3.

Treatment.—The child was treated by allowing his head to hang over the end of a mattress placed under the shoulders, and when the dislocation had been reduced a plaster collar was applied.

II.—Elizabeth B., aged 5 years, first seen May 20, 1938.

History.—She had previously attended the Paddington Green Children's Hospital, where an abscess in the neck had been opened. Subsequently stiffness in the neck developed and she was referred to the Infants Hospital. X-ray examination showed dislocation of C 2 and C 3.

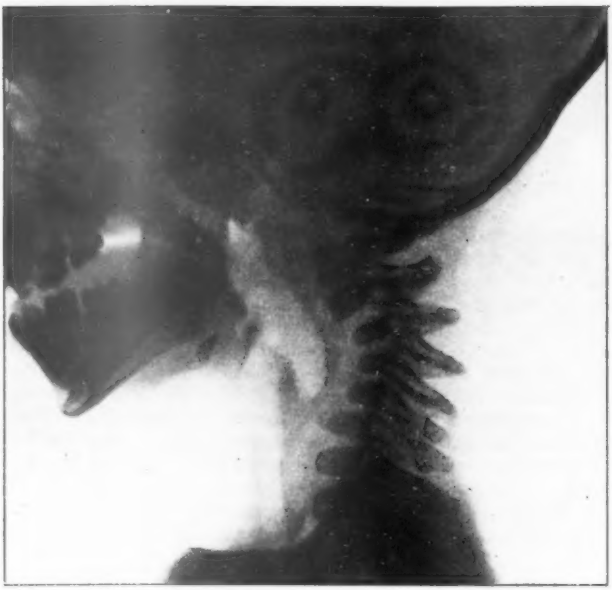
Treatment.—The child was treated with her head in hyperextension, and when the dislocation was reduced, a plaster collar was applied.

The PRESIDENT said that these two cases were very rare. He did not know of any previously reported cases in which an inflammatory dislocation had occurred at the level of C 2 and C 3. In all the reported cases that he knew—including three which he had himself seen, the dislocation had occurred at the level of the 1st, or 1st and 2nd cervical vertebræ.

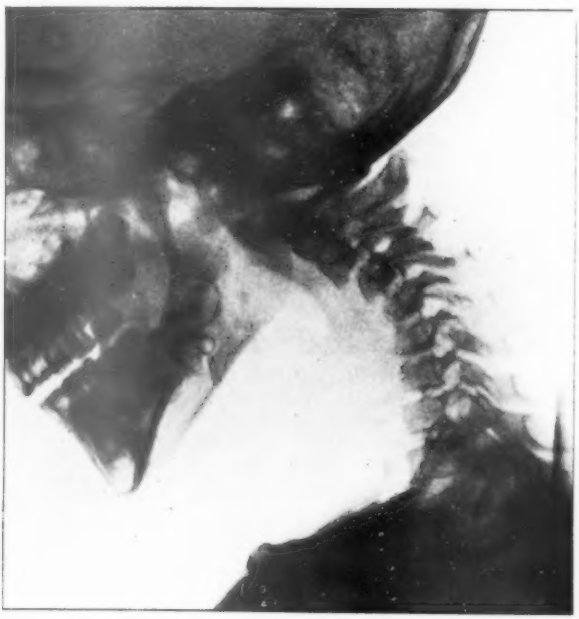
Intermittent Metrochylorrhœa.—G. L. S. KONSTAM, M.D.

This case was shown by Mr. V. B. Green-Armytage at a meeting of the Section of Obstetrics and Gynæcology, on October 16, 1936 (*Proc. Roy. Soc. Med.*, 30, 49).

Norma H., aged 15 years, was seen, when aged 6½, by Dr. Janet Aitken at Princess Louise's Hospital, on account of profuse vaginal discharge. No pus or gonococci were found. The discharge ceased, but a month later it recurred, and the Pathological Department at St. Mary's Hospital then reported that it contained organized fibrin



Raymond K. 4.7.38.
Dislocation of the 3rd cervical vertebra forwards on the 4th.



Elizabeth B. 20.5.38.
Partial forward dislocation of 2nd and 3rd cervical vertebræ. Decalcification of all cervical vertebræ.

with diffuse cellular infiltration, mostly small lymphocytes. During the next three years the discharge recurred from time to time; it was profuse and milky, and occasionally tinged with blood. In 1933 an erysipeloid rash developed on the buttocks.

In January 1934 Mr. O. Addison, at the Hospital for Sick Children, Great Ormond Street, examined the patient under an anæsthetic and found the vagina normal except for slight redness, and the uterus not enlarged. Cystoscopy showed nothing abnormal. The discharge, which was again examined, consisted mainly of fibrin and old blood, the whole being infiltrated with lymphocytes; no organisms were seen. Subsequently the milky discharge recurred at intervals of several months. Severe attacks of pyrexia and erysipeloid rash on the buttocks occurred intermittently.

In February 1934 the patient was admitted to the West London Hospital, for further investigations, and the uterus at that time was found to be infantile. While in hospital she had an attack of cellulitis of the buttocks, with high pyrexia. A month later Mr. Green-Armytage performed laparotomy, and found only slight cystic enlargement of both ovaries (not pathological). The uterus was infantile, and no lymphangioma was discovered in the pelvis. The appendix was removed and the abdomen closed. A week later another attack of cellulitis developed.

In May 1934 the patient returned to hospital with a still more profuse discharge, which was seen to pour out of the external os uteri at the rate of one drop per minute.

Report on fluid (Dr. Elworthy): "No cream forms on standing, and very little deposit; only an occasional red blood-cell and ectodermal cell could be found in the fluid. Lymphocytes are present in fair numbers. No flagellates; the fatty particles are very small in size and could be cleared with ether. Cells of a secretory nature were not noted."

Biochemical examination (Dr. Archer): "The milk-like fluid is alkaline in reaction. Microscopically there is fat in a very finely divided form. This fat could easily be extracted with ether. Protein is present. The fluid has typical characteristics of chyle."

There has never been any chyluria. The discharge continued, and as much as two pints of chyle were passed a day. A sound was passed into the uterus, and for a time the discharge practically ceased.

Since 1934 the general health has been good, and the chylorrhœa was only occasional until August 1938; since when it has occurred at intervals of from two to fourteen days. The discharge at such times is copious and white in colour.

The right thigh, which previously had been considerably swollen owing to lymphatic obstruction, is now only $\frac{3}{4}$ in. greater in circumference than the other thigh.

Hystero-salpingography, carried out by Mr. Green-Armytage, showed no abnormality of the uterus or tubes.

Discussion.—Dr. PARKES WEBER thought the condition was due to intermittent leaking of a lymphatic (chylous) vessel into the uterine canal, as he had maintained in October 1936 (*Proc. Roy. Soc. Med.*, **30**, 52). A lymphatic (or chylous) vessel might leak (mostly intermittently) into the urinary canal, into the alimentary canal, or on the surface of the body, and why should not similar leakage occur into the uterine canal, though no other case had yet been described?

Mr. SIMPSON-SMITH said that if the metrochylorrhœa was due to a leaking lymphatic stoma, as suggested by Dr. Parkes Weber, $\frac{1}{2}$ to 1 c.c. of sodium psylliate or other sclerosing fluid might be injected through either fornix into the base of the broad ligaments, for here the majority of the lymphatics of the uterus converged. Failing this, a light diathermy of the uterine mucosa ought to seal the leaking stomata.

[*The report of other cases shown at the meeting will be published in the next issue of the* PROCEEDINGS *of the Section.*]

Section of Dermatology

President—H. HALDIN-DAVIS, F.R.C.S.

[*October* 20, 1938]

? Atypical Granuloma Annulare.—C. H. WHITTLE, M.D.

Patient, a girl aged 7.

For five years there has been a swelling on the middle finger of the right hand. The lesion has extended and a new lesion has arisen on the index finger of the same hand, immediately opposed to the original lesion. The lesions are nearly the same colour as the skin, though they are a little redder, and cause no pain or discomfort. In December 1935 they were treated by a surgeon with radium—the amount and duration are not recorded. They were also treated with carbon-dioxide snow freezing by the same surgeon in September and October 1936.

The patient was referred to me on August 29, 1938. An interesting feature is the appearance of a new lesion on the index finger at the spot which is in contact with the original lesion on the middle finger.

Kahn and Wassermann reactions negative.

Discussion.—Dr. R. T. BRAIN said he had seen two similar cases in the Hospital for Sick Children, Great Ormond Street. The lesions were on the toes and he had been impressed by the extraordinary appearance and by the hardness of the lesions. He could not give the condition a name, but sent one of the children for biopsy and the report was to the effect that the lesion was practically a pure hypertrophy of the stratum corneum (i.e. a keratoma). After several radium treatments the lesion became very much flatter. In the other case—clinically identical—the lesion did not respond to irradiation.

Dr. H. MACCORMAC said the lesions bore a close resemblance to the condition which Crocker described as erythema elevatum diutinum.

Dr. A. M. H. GRAY said he remembered showing a case to the Section which was rather like Dr. Whittle's first case, and in which the lesion had eventually proved to be sarcoma of the skin. He thought that Dr. Whittle's case should be considered from that point of view.

Dr. A. C. ROXBURGH said he had seen a lesion on the back of the forearm of a woman aged 56 which was somewhat similar in appearance to those in Dr. Whittle's case. The histology had shown it to be granuloma annulare. Eventually it cleared up. This was one of three cases of granuloma annulare which he had shown at the last meeting of the British Association of Dermatology in London, July 1936 (*Brit. Journ. Derm. and Syph.*, 1936, **48**, 633). He suggested that Dr. Whittle should have a microscopical examination made; one of the peculiarities of granuloma annulare was that frequently if a piece was removed for examination the whole lesion cleared up.

Dr. WHITTLE (in reply) said he wished to emphasize the fact that in his first case the lesions on the two fingers were in apposition—which seemed to be in favour of granuloma annulare. He had seen that condition in such cases, spreading on to the adjacent finger as if from contact, and he thought that the case in question was more likely to be of that nature than to be true neoplastic sarcoma. A five-years' history was rather against the idea that the lesion was sarcomatous.

Acute Lichen Planus.—C. H. WHITTLE, M.D.

Mrs. M., aged 50, widow.

First seen on September 6, 1938. The eruption had appeared seven weeks previously on the inner side of the knees and had spread over the rest of the body. It has been intensely itchy from the onset.

The lesions are bright bluish-red papules, with typical flat-topped and polygonal shapes. When first seen the eruption was very florid and the lesions were more œdematous than usual. There was some tendency to scaling, particularly on the lower limbs. The distribution was on the flexor surfaces of the forearms, on the knees, on the inner sides of the thighs and legs, and also on the points of the shoulders. There were typical white flecks in the mouth on the buccal mucosa.

An interesting feature of the case is that the condition was diagnosed as acute psoriasis by the patient's doctor. There were certainly several features suggesting psoriasis when I first saw her. Some of the papules gave the psoriatic reaction to grattage, but the majority showed the characteristic features of lichen planus, and the lesions in the mouth confirmed the latter diagnosis.

Kaposi's Disease.—LOUIS FORMAN, M.D.

A. L., male, aged 63.

Duration of disease fifteen months ; first noticed on dorsal aspect of toes. Skin of toes and adjoining parts of dorsal aspect of feet infiltrated and cyanotic. Cyanotic plaques over both heels.

Microscopical section.—Foci of new capillaries deep in dermis, with surrounding lymphocytic infiltration. Throughout the section are free pigment granules and numerous chromatophores.

Discussion.—Dr. A. M. H. GRAY asked if those who had seen the case had noticed whether there was much pain in the patches. Pautrier, who did a good deal of work on the subject, considered the disease to be of nervous origin, and stated that the patches were painful.

Dr. R. KLABER said he had recently followed the treatment of two such cases. Both patients complained of pain, one especially when new lesions were appearing, but only then. In the other case fungating tumours developed on the toes and the pain was intense and persistent. The first case was treated with ordinary superficial X-rays (100 kv.) which seemed to help hardly at all. The second patient was experiencing great relief from deep X-rays (250 kv.). There seemed to be some difference between the therapeutic response obtainable from these two forms of radiation.

Bowen's Disease simulating Lupus Vulgaris.—ELIZABETH HUNT, M.D.

V. V., a woman aged 65, states that she has had a sore patch on her leg for over twenty years. It began as a tiny brown spot which she squeezed till it broke. It then became worse and spread. The patch is situated on the external surface of the middle third of the right thigh. It is roughly circular in outline and about 3 in. in diameter, and is not bound down to underlying tissue, nor is it definitely infiltrated. It had somewhat the appearance of a plaque of psoriasis when I first saw it, and on grattage the papillary vessels were dilated.

It is now brownish in colour, except where healing, with scarring, appears to have occurred. There is slight scaling of the surface. At the lower part a few warty-looking excrescences are present, and in the centre there is a small ulcerating area.

A biopsy was made, and I am indebted to Dr. Freudenthal for the diagnosis.

Although Bowen, in 1912, described the condition as a precancerous dermatosis, it is now regarded as a form of intra-epidermal carcinoma. It may occur on any part of the skin and has often a very prolonged course. In this case the condition

suggested lupus vulgaris because of the prolonged history, the superficial ulceration, and the healing of part of the affected area, with the formation of scar tissue. No "apple-jelly" nodules, however, were observed.

Discussion.—Dr. W. FREUDENTHAL said that the microscopical section showed a typical picture. He had once been asked to make a biopsy in a similar case which had been diagnosed as one of tuberculosis verrucosa cutis. The biopsy when completed supplied one of the best sections of Bowen's disease that he had ever obtained, though when he began it he had not had the slightest doubt that he was dealing with a case of tuberculosis verrucosa cutis.

Dr. H. SEMON said he, too, had found great variation in sensitivity to X-rays in such cases. Some responded; others did not. If X-rays failed he would be inclined to apply the creosoted salicylic acid plaster (Beiersdorf 78) which in the superficial types acted with as much specificity as it did in lupus vulgaris, for which it was originally designed.

Dr. J. H. TWISTON DAVIES said he had seen three or four of these cases. No doubt owing to his failure to diagnose them immediately he had made the curious discovery that they responded very well indeed to crude coal-tar ointment. He did not know whether the good effect was due to the tar or to maceration, but the fact remained that at any rate in the very superficial seborrhœic eczema-like lesions the disease disappeared, temporarily of course, without trace. Recently he had been using thorium X. A case shown at a meeting of this Section in 1927 (*Proc. Roy. Soc. Med.*, **20**, 1831, Sect. Derm., 111) which resisted diathermy, steam cautery, carbon-dioxide snow, X-rays, and radium, finally responded to thorium X and had remained without recurrence for twelve months.

Dr. I. MUENDE said that with regard to the effect of crude coal-tar on Bowen's disease, a condition simulating this disease was produced in mice as an intermediate stage in the development of cancer in these animals when treated with crude-tar. He agreed with Dr. Dowling that there was a distinct difference between the superficial basal-celled epithelioma of Little and Bowen's precancerous dermatosis. Again one should be able to differentiate between Paget's disease and Bowen's disease, for whereas the cells surrounding the Paget's cell were almost normal, in Bowen's disease, the epidermis as a whole appeared to run riot and the condition often looked more malignant than frank squamous-celled epithelioma.

Dr. ELIZABETH HUNT said that the patient had, curiously enough, found an ointment containing bismuth oxychloride very useful.

Poikilodermia Atrophicans Vascularis (Lane's Type).—G. B. MITCHELL HEGGS, M.D.

E. P., a postman, aged 50.

History.—No previous illness. In 1922 he noticed an irritation at the sides of the neck, which gradually spread on to the chest, thighs, and legs. The irritation has been very marked since 1933.

Present condition.—The general appearance suggests a diffuse patchy atrophy, associated in some places with simple erythema but in others with erythema with scaling.

On examination.—On the chest these red areas are the site of pruritus. In certain areas, particularly the forearms and shins, the redness is associated with telangiectasia, whereas on the upper arms, trunk, and thighs, there is a brownish pigmentation. Telangiectasia is present behind the malleoli of the ankles, and here also there are a number of small scars and healing ulcers. Otherwise no signs or symptoms of disease.

Microscopical sections (Professor W. D. Newcomb).—Section (*a*) from forearm: Thin, atrophic skin. Absence of dermal papillæ. Slight perivascular lymphocytic infiltration. Elastic and collagen less but in stouter fibres than usual. Section (*b*) from leg: Considerable hyperkeratosis with atrophy of the epidermis. Œdema of papillary layer but absence of papillæ.

The cellular infiltration is more marked in section (*b*) than in section (*a*). Much pigmentation in melanophores in one small area of the dermis.

? Lupus Erythematosus. ? Lupus Vulgaris Erythematoides (Leloir): Case for Diagnosis.—G. B. MITCHELL HEGGS, M.D.

A. P., male, aged 36. Van driver.

History.—In 1935 small scaly patches developed on the face. Treated in provincial hospital with long courses of gold, and later with courses of bismuth injections.

On examination.—September 1938: Red, scaling, atrophic patches on the scalp, cheek, and nose, from 1–2 cm. in diameter, with some infiltration at the edges on diascopic examination and palpation. No "apple-jelly" nodules.

Previous history.—1931–32, pyorrhœa and some dental caries. Now edentulous. No other illnesses.

Family history.—Nothing relevant.

General examination.—No pathological signs or symptoms detected. Blood Wassermann reaction negative. Sedimentation rate: 5 mm. in ½ hr.; 12 mm. in 1 hr.; 30 mm. in 2 hr. Column length 197 mm. Blood-count: Normal. Skiagrams: Chest and small bones of hands healthy and normal.

Biopsy report (Professor W. D. Newcomb): Appearance does not suggest syphilis or lupus erythematosus. One small giant-cell system near a hair follicle suggests lupus vulgaris.

Discussion.—Dr. I. MUENDE said that the histology suggested lupus erythematosus with features not unlike those seen in true lupus vulgaris. The nodules described were not typical of this latter condition and there were numerous giant-cells lying without the nodules in areas where the collagen had undergone degeneration. He thought that this was a case of destructive lupus erythematosus showing phagocytosis of collagen. He had seen a similar histological picture in a case of undoubted lupus erythematosus in which the destruction of connective tissue had resulted in deeply depressed scars.

Dr. W. J. FREUDENTHAL said that clinically the condition seemed like lupus erythematosus, but the histology of a second biopsy was very typical of lupus vulgaris. When he first saw the case he had taken it to be one of lupus erythematosus, so he thought the name given by Leloir might be used for it.

Senile Sebaceous Adenoma.—F. JACOBSOHN, M.D.

S. C., male, aged 67.

On examination.—On both sides of the nose are many comedones and several hard yellowish plaques consisting of slightly translucent flat irregular papules. The capillaries and superficial veins are distended. There is slight seborrhœa of the scalp and there is some rosacea of the face.

History.—The patient has always had comedones. About a year ago his nose became red and swollen but was not painful. The yellowish plaques then appeared.

Treatment.—12.10.38: Thorium X, 1,500 e.s.u. in 1 c.c. of varnish. 19.10.38: Repeated.

Commentary.—Nomland (*Arch. Derm.*, 1930, **22**, 1004) published the first report of cases of senile adenoma sebaceum. The report dealt with five cases in all of which there was evidence of seborrhœa or rosacea. The patients were between 45 and 60 years of age.

The condition had been previously described by Unna, who considered it due to hypertrophy of the sebaceous glands. Gans thought it might be a sebaceous-gland

nævus, or a functional hyperplasia. Jadassohn disagreed with the use of the term "adenoma". Histological examination in Nomland's cases revealed sebaceous hyperplasia, growing from the lanugo hair follicles in a rosette-like manner. The fact that Nomland's cases showed some evidence of seborrhœa, which is also present in this case, suggests that this factor may be of importance.

Discussion.—Dr. PARKES WEBER said he thought the appearance was that of a mild form of rhinophyma, most cases of which dated before the era of biopsies and microscopical examinations. He would like to know something about the patient's digestive functions and, especially of course, with regard to his taking of alcohol.

Dr. JACOBSOHN (in reply) said that there was no gross complaint of any digestive disorder, and the patient could not be called alcoholic. He thought there were two kinds of rhinophyma, one *sui generis*, the other closely connected—always after many years—with profuse rosacea. The rosacea in this case was—judging from the state of the blood-vessels—of many years' standing, and the patient also had acne and comedones. The yellowish plaques of the sebaceous material and the papules were in some places depressed and flat and had an irregular outline, which made one think that the case might be one of rhinophyma, though he personally did not believe it to be a genuine case of that type.

Unilateral Swelling and Erythema of the Face.—NORMAN BURGESS, M.D.

J. P., a woman aged 21, has always noticed that the right side of the face has flushed more than the left, especially in a hot room, after rubbing the skin and after hot meals. During the past two and a half years she has noticed that it is swollen, and that it throbs when it is flushed.

The pupils are equal and there is no alteration in the reflexes.

Radiological report: Slight mucosal thickening of both maxillary antra. Nasal septum deviated to the right. Unerupted wisdom teeth present on both sides in both upper and lower jaws.

Report of ear-nose-and-throat surgeon: No evidence of infection in the nose or throat to account for the condition.

Report of dental surgeon: No probable dental causes found.

Discussion.—Dr. F. PARKES WEBER suggested that this was really only a recurrent unilateral flushing of the face, the increase in size being no more than one would expect as a result of frequent hyperæmia, which gave rise to an over-nutrition of the connective tissue of the part. He gathered that there was no local sweating accompanying the attacks of flushing. The case reminded him of what he had seen in connexion with scars under the jaw on one side of the face. In such typical cases the unilateral flushing, mostly together with a certain degree of sweating, recurred whenever the patient ate. This might continue for a number of years without much change, and the patient become perfectly accustomed to the state of affairs. The present patient had told him that the flushing on the side of the face occurred when she ate a hot meal. He would like to test the effect of placing in her mouth various kinds of stimulating foods and fruits, pieces of apple especially, to see whether any or most of them produced the same effect. In this case, however, there was no discoverable scar anywhere, such as might be involving and irritating sympathetic nerve-fibres. He did not think that any operation on sympathetic nerves or ganglia was likely to improve matters, and the slight inconvenience caused by the flushing was not hard to bear. (Compare F. P. Weber, *Trans. Clin. Soc. Lond.*, 1897–1898, **31**, 277, and *Medical Press*, 1905, **130**, 261.)

Dr. J. H. TWISTON DAVIES said that a short time ago he had seen a similar case. A girl complained of swelling and redness of the cheek which had persisted for six months after an empyema of the corresponding antrum had been drained. He was unfamiliar with the condition,

and it did not occur to him that the antrum infection might have been just a coincidence. He understood that the skiagrams showed thickening of the lining of both antrums. Infection of an antrum might be completely silent and it might come and go without the patient knowing anything about it. He suggested that this had happened in the present case.

Dr. H. C. SEMON said that there might be a reflex connexion with one or more unerupted wisdom teeth. It was extremely difficult for a dentist to ascertain whether or not an unerupted wisdom tooth was a septic focus, in any given case. He suggested that the unerupted wisdom teeth on the side affected be removed.

? Lupus Erythematosus : Case for Diagnosis.—HUGH GORDON, M.C., M.R.C.P.

The patient is a man, aged 50. Previous history immaterial.

History of present condition.—At the beginning of June 1938 he had a sudden onset of flushing, localized to the left side of the face : constitutional disturbances were severe and the condition was diagnosed by his doctor as erysipelas. The left side of the nose and cheek and the upper lip were said to be swollen and extremely painful. He was kept in bed for a fortnight, during which the local and general condition subsided.

He was first seen at the beginning of August, i.e. two months after the attack—complaining of severe pains and stiffness still in the left side of the face.

On examination well-marked scarring was seen on the left side of the nose and on the upper lip. Interspersed with the scarring were areas in which the sebaceous glands were hypertrophied, giving the skin a nodular appearance. The whole area was, however, slightly atrophied. No diagnosis was made, since such scarring appeared unusual following an erysipelas, and the remaining condition did not conform very definitely to any known type.

Since that date he has had six injections of sanocrysin, 0·1 gr., and there has been considerable improvement. The nodular areas have flattened and the subjective symptoms have diminished. The case is shown for diagnosis as being possibly one of an unusual form of scarring following erysipelas, which the original attack (so far as can be gathered) appeared to resemble. The improvement may have been due simply to time. The appearances are, however, more suggestive of lupus erythematosus than anything else, and the original attack may have been one of an unusually acute form of that disease.

Discussion.—Dr. H. MACCORMAC said that he had had a similar case referred to him a short time ago and had come to the conclusion, on the history, distribution, and scarring, that it was the sequel of a previous attack of herpes zoster.

Dr. GRAY said that he had actually seen a case of middle division of the 5th nerve in the acute stage which had been diagnosed as erysipelas, and in which there was much sharply defined ulceration. The history of the case under discussion rather suggested herpes zoster, particularly the pain which seemed to have occurred in Dr. Gordon's case.

Dr. GORDON (in reply) said that he was much interested in Dr. Gray's suggestion that this was a case of scarring after herpes zoster. The patient had been definitely certain that at no time had the skin been broken, and it was this which seemed to negative the diagnosis of herpes. It was possible, however, that the scabs had been slight and had been masked by the ointment applied. The scars now remaining were certainly more typical of herpes than of anything else.

Dr. A. C. ROXBURGH asked Dr. Brain if it was possible by complement-fixation tests to ascertain whether the patient had had herpes zoster or not.

Dr. BRAIN said that it was possible, but the presence of antibodies did not necessarily prove that a previous eruption was herpes zoster. A positive complement-fixation reaction might, however, be regarded as strong circumstantial evidence that the patient had had zoster or chicken-pox within eighteen months.

Gold Dermatitis.—HUGH GORDON, M.C., M.R.C.P.

The patient, a woman aged 60, has suffered for some years from rheumatoid arthritis. She has had five injections of myocrysin, each of 0·1 gr. After the last injection an exfoliative condition of the skin is said to have begun. She was at no time hospitalized and the skin is said to have greatly improved. Last month, however, the condition has been stationary.

On examination.—Chest and abdomen: Large number of circular pigmented marks. Arms and legs: Areas of hyperkeratosis; these are extremely confluent but a certain number of papular elements can be made out from which, after the scales have been removed, a moist surface remains. In the buccal mucous membranes veining is still to be seen.

It can only be said with certainty that this is a case of gold dermatitis. It may be one of those cases with marked pigmentary disturbance, following an exfoliative dermatitis; it may, however, equally well be one of an acute, though rather unusual, lichen planus which has been activated by gold. Such cases are not uncommon and suggest a biotropic response—i.e. a heavy metal activating a virus, as occurs not infrequently in cases of herpes zoster.

Dr. A. C. ROXBURGH said that a condition of hyperkeratosis was quite consistent with that of gold dermatitis. He had had an elderly woman patient whose case he had published in the *Brit. Journ. Derm. and Syph.*, 1936, **48**, 137, who had had a large number of injections of gold for rheumatism, following which she had extremely severe dermatitis and was in the Masonic Hospital from August to December 1935. Her wrists and legs were covered with big horny crusts, much more pronounced than those in Dr. Gordon's case. She had been really ill for a long time, but ultimately recovered, though considerable scarring remained. He thought Dr. Gordon's case was one of hyperkeratosis associated with gold dermatitis.

Alopecia Congenita: Minor Ectodermal Defect.—R. T. BRAIN, M.D.

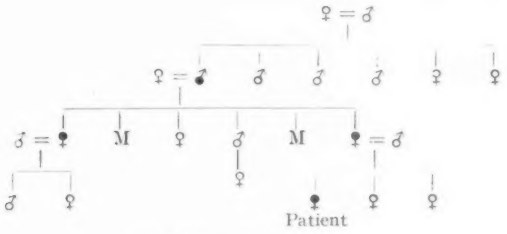
W. E. A., a girl aged 8, was brought to hospital for advice as to treatment of alopecia.

She is a thin nervous child who has never enjoyed vigorous health; her previous illnesses were whooping-cough and chicken-pox.

The hair on the scalp is thin, blonde, and very scanty, and its maximum length does not exceed 5 in. She has never had more hair than this, and sometimes has even less. The individual hairs are not uniformly round, and by reflected light have the appearance of monilethrix, but microscopical examination did not confirm this impression. The skin of the scalp is thin, dry, and parchment-like, with slight scaling but no scurf. The glabrous skin is not obviously abnormal nor are the teeth and nails.

Family history.—The parents are not consanguineous. The defect can only be traced back to the maternal grandfather whose parents and three brothers and two sisters were unaffected. His family consisted of three daughters and a son who married and had a healthy daughter. Two of the three daughters married; one had a healthy boy and girl; the other, the mother of this patient, had two other healthy girls. A chart showing the family tree is appended. The condition remains

the same throughout life. I have seen an aunt of this patient wearing a transformation on account of alopecia totalis.



M = Miscarriage

Section for the Study of Disease in Children

President—E. A. Cockayne, D.M.

[*October* 28, 1938]

Two Cases of Dermatomyositis.—R. E. Bonham Carter, M.R.C.P. (for the President).

I.—Girl aged 3 years and 3 months. First admitted to hospital in July 1937 (then aged 2). Has been under observation in hospital and at the convalescent home ever since.

Chief complaints.—(1) Progressive weakness of lower limbs for six months, i.e. from the age of 18 months. (2) Frequent falls, with inability to pick herself up.

Past history.—Full-term child, normal delivery. Birth-weight 8½ lb. Milestones in development all normally passed. Parents healthy. Two other children, both female, aged 5 and 4 years respectively.

On examination (5.7.37).—Miserable child. Squamo-erythematous rash on face and hands. Subcutaneous tissue of right thigh noticed to be more solid and thicker than normal. No paresis, but all muscles hypotonic. Knee-jerks and ankle-jerks absent. Liver palpable (2 fingerbreadths). Gait waddling. Temperature normal to 101°. Pulse-rate 100–130.

Investigations.—Cerebrospinal fluid, blood-count, and urine, normal. Wassermann reaction negative. Sedimentation rate : 34 mm. in one hour. Skiagrams : Normal except for evidence of generalized decalcification. Electrical reactions indicated a lesion of the muscle tissue itself.

The patient was sent to Tadworth convalescent home with a provisional diagnosis of polyneuritis of undiagnosed origin. Treatment : Ryzamin-B, minims 3, t.d. No appreciable change in condition.

29.11.37 : Readmitted to hospital, suffering from (1) retention of urine—*B. coli* pyelitis ; (2) staphylococcal abscess of buttock ; (3) œdema of back.

The pyelitis was treated successfully with sulphanilamide ; the abscess incised and drained with an uneventful recovery. On lumbar puncture the cerebrospinal fluid was again proved to be normal. The child was at this time unable to stand or to sit up without assistance. The rash remained unchanged. Liver still enlarged. Treatment : Ryzamin-B. Patient sent to convalescent home again.

26.4.38 : Curious subcutaneous thickening of the anterior surfaces of both thighs noticed. It resembled a localized œdema but did not pit under pressure.

3.5.38 : Rigidity of joints especially the hips, with marked limitation of abduction. Frequent attacks of tonsillitis. Readmitted to hospital for tonsillectomy.

On examination (8.7.38).—Miserable but well covered. Pink peeling erythemato-squamous rash of face, anterior part of thighs, axillæ, and upper chest. Telangiectatic condition of skin of fingers, most marked on knuckles. Lilac-coloured œdematous eyelids. Trunk and limbs covered with patchy erythema. Skin of forehead thick and immobile.

Muscles : Uses upper limbs normally, but cannot completely extend elbows. Lower limbs : Pain on flexion of both Achilles' tendons and of lower limbs at knees and hips. Contractions of adductors of hips. Wasting not more than expected in a child so long in bed.

Central nervous system : Ankle-jerks − − ; knee-jerks ++, difficult to elicit ; triceps, shoulder and biceps − −. Abdominal reflexes present. Plantar ↙↙. Sensation normal. Chest : Nothing abnormal. Abdomen : Liver still just palpable. Cardiovascular system : Nothing abnormal.

Temperature : 99·6° F., normal. Pulse 110–130. Sedimentation rate : 28 mm. in one hour.

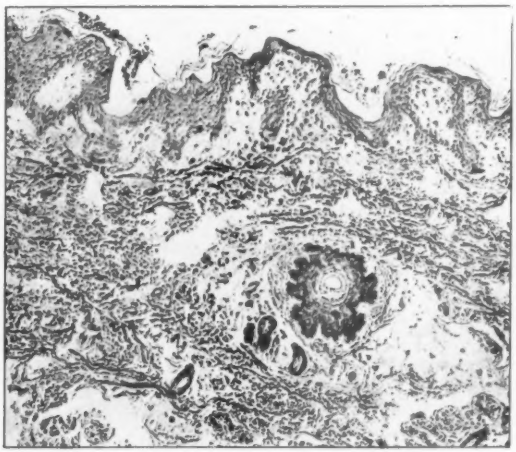


FIG. 1.—Section of skin. × 40. Great thinning of epidermis, œdema of dermis proper, some increased vascularity.

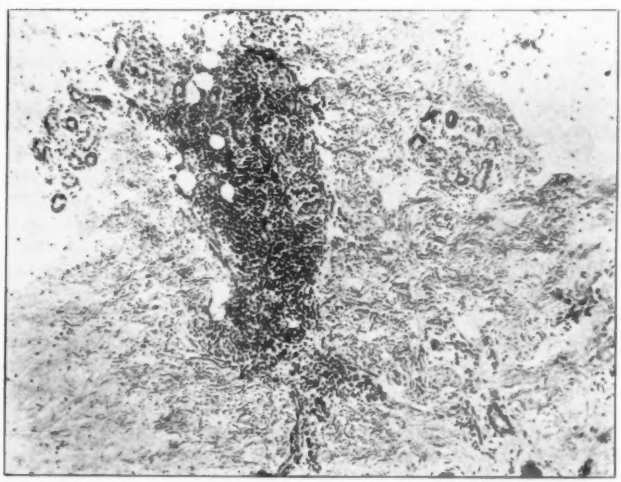


FIG. 2.—Section of subcutaneous tissue. × 40. Marked œdema, a large lymphorrhage, and some increased vascularity.

Investigations.—Calcium, phosphorus, and phosphatase : Normal. Mantoux reaction negative.

Biopsy of the anterior and exterior part of the thigh—removing skin, subcutaneous tissue, and muscle-fibre: Pathological report on microscopic sections:

FIG. 3.—Section of muscle. × 40. Œdema again with marked degeneration of muscle fibres and a large lymphorrhage.

Typical of dermatomyositis. Thinning of the epidermis with almost complete disappearance of papillary process. Increased vascularity with occasional lymphorrhages. Atrophic muscle fibres with round-cell infiltration (figs. 1, 2, 3).

II.—Boy, aged 8 years, admitted to hospital 20.4.38, complaining of (1) unsteady handling of spoon and fork for one week; (2) pain in the legs and shoulder for one week; (3) one week after admission he could not stand or sit up without assistance.

Past history.—Parents well and healthy. Three children: the patient, and two others, who are rheumatic. One paternal uncle had paralysis of legs for three months at the age of 11. ? poliomyelitis.

On examination.—Skin lesions: Distribution. Extensor surfaces of knuckles, knees, malleoli, and elbows; round the eyes, over the forehead and scalp. Description: Circumscribed pink, squamo-erythematous rash, fading on pressure; peeling and scaling in some places, notably on the forehead; lilac-coloured round the eyes. Since the patient's admission the lesions on the hands have become noticeably more telangiectatic. There is thickening of the subcutaneous tissue of the forehead, anterior of thighs, and extensor surfaces of arms.

Central nervous system: Ankle-jerks ++; knee-jerks ++ (with reinforcement); biceps ++ (very weak); triceps − −; shoulder − −. Abdominal reflexes present. Plantar ↙↙. Sensation normal.

Investigations.—Mantoux reaction: Negative. Skiagram of chest normal. Antra normal. Sedimentation rate: 15 mm. in one hour. Urine: Trace of albumin—less than 10 mgm. Cerebrospinal fluid normal. Wassermann reaction negative. Blood-count normal.

Muscles (present condition): Contracture of both elbows, both Achilles tendons, both adductors and abductors of hips; some contracture of the extensors of the knees.

Pathological report on biopsy: Epidermis very irregular and thinned; papillary layer of dermis destroyed; stratum granulosum ill-defined. Excess fibrous tissue in the superficial part of the dermis. Little round-celled infiltration.

Urine: Estimation of creatine and creatinine:—

Case I.—Pre-formed creatinine 30·8 mgm.%; creatine 64·2 mgm.%.
Total volume of urine 181 c.c.
Total excretion: Pre-formed creatinine 54 mgm.; creatine 116 mgm.

Case II.—Pre-formed creatinine 38·8 mgm.%; creatine 62·2 mgm.%.
Volume of urine 382 c.c.
Total excretion: Pre-formed creatinine 148 mgm.; creatine 260 mgm.

These creatine figures show a definite pathological change in that the normal figure for creatine in the urine of children of this age, as given by Harris, is in the region of 10 mgm.%. Dr. Payne, however, has figures in normal children up to 50 mgm.%, but the figures in these two cases are outside the highest normal limits. Also the normal creatine-creatinine ratio is reversed; normally there is always more creatinine than creatine excreted.

Comment.—Although the microscopical findings in the second case are not typical, the two cases are so much alike clinically as to leave no doubt that the patients are suffering from the same condition. There are many points of similarity, but the salient ones are as follows: The facies, particularly the lilac colour round the eyelids; the telangiectatic condition of the knuckles; the thickening and immobility of the skin; the muscular contractures; the high sedimentation rate; the creatine and creatinine figures.

Discussion.—Dr. F. PARKES WEBER referred to the case of a man, aged 49, which he, with Dr. E. Schwarz, had described in a paper on "Erythrodermia with œdema" (*Brit. Journ. Derm. and Syph.*, 1932, **44**, 187, Case 2). The description showed that that case would now be regarded as one of "poikilodermia-dermatomyositis", which lasted from August 1930 till about July 1931. The finally good result might have been connected with intensive treatment by intravenous calcium chloride injections, but the patient afterwards died in the Maudsley Hospital from a cerebral tumour, as the necropsy showed. The case further illustrated the undoubted fact that cases of the erythrodermia and œdematous type of what was now known as "poikilodermia-dermatomyositis" were not classified under the latter name seven years ago. Perhaps in Dr. Bonham-Carter's cases calcium therapy would be worth further trial.

Dr. W. M. FELDMAN suggested that the amount of vitamin B_1 in the blood of these patients should be estimated, and that if it was found to be deficient, pure vitamin B_1 should be given by intramuscular injection

Achalasia.—R. H. DOBBS, M.R.C.P. (by permission of Dr. WILFRED PEARSON).

Ronald H., aged 6 years, had an uneventful past history until one year ago, since when he has had gradually increasing difficulty in eating. He vomits after every two or three mouthfuls at each meal. There is no pain and he does not have any sensation of the food sticking. The difficulty has become greater during the last six months and recently he has been able to take solids and fluids only very slowly. Vomiting occasionally occurs after one or two hours, when considerable mucus and saliva is brought up and the vomit does not "smell like ordinary vomit".

The boy has felt well in himself but is always hungry and has progressively lost weight. He weighed 3 st. 4 lb. in November 1937, and 2 st. 10 lb. 12 oz. on August 15, 1938.

When admitted to University College Hospital in August 1938 he was thin and somewhat emaciated, but did not appear ill and was cheerful and lively. Examination revealed no abnormal physical signs. On being given water to drink he sipped it very slowly, taking a quarter of an hour to finish one cupful. On being given food he took only very small quantities at a time, and in half an hour food mixed with

saliva was returned. There was no evidence of gastric juice and the food was alkaline in reaction.

X-ray photographs of a barium swallow on August 25 showed moderate dilatation of the œsophagus, with gradual diminution in the size of the shadow, which ended bluntly at the level of the 11th thoracic vertebra. No barium passed into the stomach in the immediate X-ray picture. Under the screen waves of peristalsis were seen passing down the œsophagus. At the end of half an hour a very small quantity of barium was seen passing through as a narrow trickle and collecting in the body of the stomach. At the end of one hour and a half all the barium had passed through into the stomach quite suddenly. The actual passage of barium was not observed under the screen.

Œsophagoscopy under general anæsthesia revealed a moderately enlarged œsophagus with healthy mucosa. The tube passed easily into the stomach, and bougies were passed up to the largest bronchial series.

The child was treated with eumydrin before every meal, in increasing quantities up to 30 c.c. There was no change in the condition. From September 15 mercury bougies were swallowed immediately before each feed and an improvement in the ability to swallow food was at once noted. On 29.9.38 he was discharged with instructions to swallow his tube before each meal.

Eight weeks after admission the child was seen again. His weight was 3 st. 7 lb.—an increase of over 10 lb.—and he was taking his food satisfactorily, provided that he swallowed the bougie before each meal. A skiagram on October 20, 1938, showed that barium was still held up at the level of the cardia, but not so completely as before, and after the swallowing of the bougie the œsophagus emptied itself into the stomach satisfactorily.

The diagnosis in this case rests between cardiospasm, or achalasia of the cardia, and congenital œsophageal spasm. The latter condition most commonly occurs at the level of the 7th thoracic vertebra, and dilatation with bougies does not improve the condition. In this case the obstruction is at the level of the 11th and 12th thoracic vertebræ and, though the child at present still has to swallow his bougies at each meal, the condition is improving.

Discussion.—Dr. PARKES WEBER urged the importance of not speaking of œsophageal achalasia in children or adults as a functional disease, though (like asthma and various other not merely functional diseases) it might be greatly influenced by emotional factors. If organic treatment (passage of a tube) was neglected, the disease led to inanition, asthenia, and possibly the onset of pneumonia or pulmonary tuberculosis, or (in elderly persons) death by syncope. A gastrostomy, as a temporary means of feeding, had occasionally been carried out in adults with good result. In elderly persons with extreme dilatation of the lower part of the œsophagus (sometimes actual "bagging") a soft feeding-tube might coil up without passing through the cardia, so that the food was poured into the dilated œsophagus instead of into the stomach.

THE PRESIDENT said that, in spite of the late onset of symptoms, he thought the condition was probably congenital; as a rule symptoms first appeared when solid food was added to the diet. Possibly a change of diet at school had caused the difficulty in swallowing.

A Boy aged 4 years Weighing Ten Pounds.—STEPHEN T. FALLA, M.D.

Peter N. (fig. 1).

Family history.—This child has a twin sister who weighs 2 st. 6 lb. and is normally developed (fig. 2). There have been ten children, all normal.

History.—His birth-weight was 6½ lb. (the girl weighed 5½ lb.) and he was breast-fed for six weeks, during which he attended a welfare clinic, and his progress was considered satisfactory. He then suddenly began to vomit, and his feeding from then until he was about 8 months old consisted of water with a little brandy, as he was always sick if anything more was tried. At the age of 11 months he was seen at the

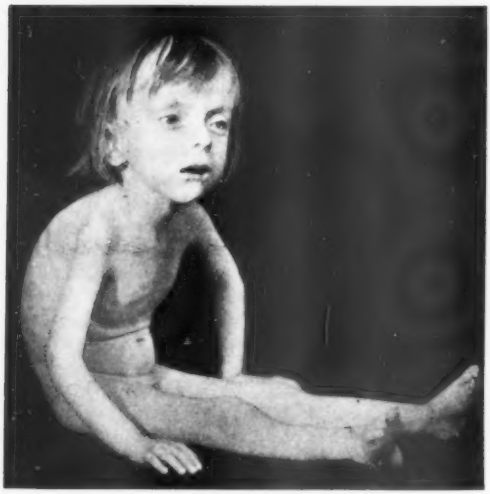


FIG. 1.—Peter N., aged 4.

FIG. 2.—Pauline N., aged 4. Twin sister of Peter N.

Jenny Lind Hospital, where his weight was found to be 7 lb. 6 oz., and a rickety rosary was present without signs of rickets elsewhere. There was no confirmatory radiological evidence of rickets.

The child was lost sight of until August 1938 when his mother again brought him to the hospital. He now weighed 10¾ lb., and his mother said that he had sat up at 3 years, 3 months, but had never stood. He is a good boy. He does not scream, and he understands a good deal of what is said, but only says a few words. His feeding has always been a great problem, as he seems to have insufficient saliva to masticate solid food. He secretes tears normally.

Condition on examination (August 1938).—Height, 26 in. ; circumference of head, 16 in. Full set of milk teeth (first tooth appeared at 7 months) ; beaded ribs, but no other evidence of rickets ; long slender fingers ; marked kyphosis. The eyes appear to be normal, and the skin is of normal texture ; the features are not coarse. There are no abnormal physical signs suggestive of congenital heart disease or cerebral agenesia (the plantar responses are flexor).

Investigations.—Wassermann reaction negative. X-rays : Long bones very slender ; no evidence of active rickets, but changes suggestive of rickets having occurred and healed. Anterior fontanelle patent. Pituitary fossa normal. Barium swallows normal.

Blood-count (15.10.38) : R.B.C. 4,200,000 ; Hb. 40% ; W.B.C. 8,000. Polys. 45% ; lymphos. 53% ; eosinos. 2%.

Examination of the eyes (Dr. G. Maxted) revealed no evidence of disease of the retina.

An attempt to obtain sufficient blood for a urea, calcium, and phosphorus estimation, was unsuccessful.

Treatment.—Under treatment with antuitrin the child's weight increased to 11 lb. 15½ oz., but he became ill. He is now being treated for the anæmia, and an attempt will be made later to begin antuitrin treatment again, using smaller doses.

Discussion.—Dr. Parkes Weber said that the patient might really be an example of "ateleiosis" in Hastings Gilford's sense. Such ateleiosis (with complete arrest in development), whether due to a change in the pituitary gland or not, might, according to Gilford, commence at any age before or after birth. In the present case the commencement of the ateleiosis might have coincided with, and have actually been due to, the pathological incident marked by convulsions at the age of 6 weeks.

The President said that this was not a case of sexual ateleiosis (Tom-Thumb dwarf) ; the birth-weight was too high and the appearance was different. Gilford's asexual ateleiosis was probably due to deficiency of the hormones of the anterior lobe of the pituitary.

Nephritis with Albuminuric Retinitis and Patent Ductus Arteriosus.—W. R. S. Doll, M.B., and J. Watts (introduced by Dr. Donald Paterson).

J. O'D., aged 9 years and 2 months, was admitted to Westminster Hospital under the care of Dr. Paterson on 7.9.38.

Complaints.—Headaches and vomiting for three years. Hæmaturia for eight months.

Family history.—Three healthy younger siblings. No heart disease known.

Past history.—No nephritis or rheumatic fever. The child has been liable to headaches since a baby, but they have been worse since the age of 7. They are of raised intracranial pressure type and are often accompanied by nausea and vomiting.

In 1935, when the patient was admitted to Luton Hospital on account of these symptoms, a heart lesion was discovered. Eight months ago she began to pass bright blood in the urine. The passage was unaccompanied by pain and has recurred at intervals since. Four months ago her vision began to fail. Epistaxis occurred once two months ago, and she has recently lost weight. She has had no dyspnœa, coma, or convulsions.

On examination.—A well-developed girl of sallow complexion. Face puffy ; no definite œdema.

Macroscopic blood in urine, and albumin in the supernatant fluid. No casts seen.

Blood-pressure about 240/140 in arms and higher in legs. No evidence of cardiac failure. Heart definitely enlarged (apex beat 4 in. to left of sternum in 5th space); no abnormal dullness in 2nd or 3rd interspaces. There was a continuous thrill and a continuous whirring murmur maximal in the 2nd left interspace, and a systolic murmur at the apex.

Vision: R. $\frac{6}{60}$; L. finger-counting at 3 ft. The retinæ showed severe papill-œdema and widespread exudate and hæmorrhages.

Temperature: 98°–99°. Pulse 100–120.

Blood urea: 43 mgm.%; creatinine 1·0 mgm.%; urea clearance 39%.

Electrocardiagram: No definite abnormality.

Blood-count: Hb. 82%, later 56%; C.I. 0·9. W.B.C. 10,000–11,000; differential count normal.

Cerebrospinal fluid: Lumbar puncture showed an increased pressure; protein 0·04%.

Blood culture and catheter specimen of urine negative.

28.9.38: Patient left hospital, having gained 4 lb. in three weeks.

17.10.38: Readmitted with the condition materially unchanged, except that no headaches had occurred since the lumbar puncture. The temperature was normal, the retinitis had progressed, and the blood urea was now 61 mgm.

X-ray examination: (1) Chest enlarged left ventricle and conus: no notching of ribs. (2) Abdomen: No evidence of calculi.

Comment.—At first the temperature, the cardiac lesion (probably a patent ductus arteriosus) and the hæmaturia suggested endocarditis lenta, but the sterile blood culture, the fact that the spleen could not be felt, and the absence of evidence of any emboli other than in the kidneys are against this. Neither chronic nephritis nor malignant hypertension would account for the cardiac lesion; nor is there any history of an acute nephritis, and no casts have been seen. A congenital dysbiotrophy of the kidney would account for the nephritis and would reasonably be associated with a congenital cardiac lesion.

Hæmolytic Anæmia in a Newborn Infant.—T. BROOKING SNELL, B.M., B.Ch. (by permission of Dr. R. W. B. ELLIS).

B. L., a girl aged 9 days, was admitted to hospital on account of anæmia.

History.—Some jaundice was observed on the second day of life, and since then the baby had become progressively paler. No blood had been noticed *per rectum*, nor indeed had there been any signs of internal or external bleeding. The birth was normal and the infant had been fed on ambrosia; she had gained weight up to the time of admission.

No history of similar condition in family. The other child (of a seven months' pregnancy) died aged 48 hours; cause of death not known.

On examination (13.10.38).—Pale, feeble child, with slight jaundice. Spleen easily palpable below the costal margin. No other abnormalities.

Next day a complete blood examination showed a severe macrocytic anæmia with a low red-blood-cell count and hæmoglobin percentage, but a high colour-index. The baby was accordingly transfused with 50 c.c. of her father's blood.

Since then, in view of the blood picture, eleven more transfusions have been given (by the internal jugular vein route) of 580 c.c. of blood; while, in addition, 20 c.c. of maternal whole blood were given intramuscularly (10 c.c. into each buttock) on October 25.

The complete blood picture has been determined each day *before* each transfusion. These are shown in table form on page 9, together with dates of each transfusion.

BLOOD-COUNTS.

	13.10.38		15.10.38		17.10.38	19.10.38	20.10.38
R.B.C.	2,060,000		2,070,000		2,520,000	2,120,000	1,280,000
Hb.	36%		45%		50%	42%	32%
C.I.	0·9		1·12		1·0	1·0	1·33
Reticulocytes	3·6%		8·8%		9·2%	12·6%	12·6%
W.B.C.	17,000				18,100	19,300	17,500
Polymorphs	36%				46·5%	55%	54%
Lymphocytes	50%	Not			35·5%	34%	33·5%
Monocytes	11%	done			12%	8%	5·5%
Eosinophils	1%				2%	3%	2·5%
Myelocytes	2%				2%	—	1·5%
Normoblasts	0%				2·5%	7%	1·5%
Megaloblasts	0%				0·5%	1%	—
Anisocytosis	+		+		++	++	++
Macrocytosis	+		+		+	+	++
Polychromasia	+		—		+	++	+

Blood transfusion	13.10.38	14.10.38	15.10.38	16.10.38	17.10.38	18.10.38	19.10.38	20.10.38
(*after* blood-count)	—	50 c.c.	50 c.c.	50 c.c.	—	50 c.c.	60 c.c.	50 c.c.

	21.10.38	22.10.38	24.10.38	25.10.38	26.10.38	27.10.38
R.B.C.	1,410,000	1,560,000	1,840,000	2,960,000	3,809,000	4,260,000
Hb.	32%	32%	35%	53%	65%	75%
C.I.	1·14	1·06	0·97	0·91	0·85	0·89
Reticulocytes	7·2%	11·6%	10·8%	2%	6·2%	2·6%
W.B.C.	15,700	17,000	13,510	12,300	10,100	10,000
Polymorphs	53%	54%	52%	54%	46%	33%
Lymphocytes	36%	34%	40%	39%	43%	55%
Monocytes	7%	7%	5%	3%	7%	10%
Eosinophils	3·5%	3%	1%	3%	4%	2%
Myelocytes	—	2%	—	1%	—	
Normoblasts	2%	12%	27%	14%	7%	—
Megaloblasts	1·5%	3%	3%	2%	—	—
Anisocytosis	++	+++	+++	++	+	++
Macrocytosis	+	++	++	++	+	±
Polychromasia	+++	+++	++	++	±	±

Blood transfusion	21.10.38	22.10.38	23.10.38	24.10.38	25.10.38	26.10.38	27.10.38
(*after* blood-count)	50 c.c.	50 c.c.	25 c.c.	50 c.c.	50 c.c. whole blood 20 c.c. I.M.	55 c.c.	—

It is interesting to record that the red cells and hæmoglobin percentage did not appreciably rise until after the tenth transfusion—which, incidentally, was the first in which blood other than that of the parents was used. I would like to have the opinion of anyone present as to whether this is of any significance.

The red-blood-cell count is now 4,200,000, the hæmoglobin percentage 75, and the colour-index 0·89, the latter having remained at, or above unity throughout.

There were no normoblasts seen at the commencement although a good normoblastosis and also reticulocytosis subsequently developed—the former reaching as high a figure as 5,211 per c.mm. on the 24th.

The reticulocyte count has now returned to normal (see *table above*).

Clinical signs: The infant, who was at first jaundiced, became less so towards the end of the first week and the jaundice finally disappeared; she now has a much pinker colour and healthier appearance—coinciding with the rise of the hæmoglobin. The spleen has remained palpable and of about the same size throughout.

Further investigations.—Two Price-Jones curves have been prepared. The first, corresponding with the state of the blood found at the first count (13.10.38), shows the presence of a 57·0% megalocytosis with a mean red-cell diameter of 8·6 μ.

The second curve, corresponding with the state of the blood found at the last

count, shows an 8·6% megalocytosis, while the mean red-cell diameter has dropped to 7·7 μ.

Other hæmatological data: Volume of packed cells 21%; mean cell volume 110 c.μ (normal 75–96 c.μ); mean cell thickness 1·76 μ (normal 1·7–2·5 μ); fragility of R.B.C., commencing hæmolysis 0·44% NaCl; complete hæmolysis 0·32% NaCl. Van den Bergh reaction, indirect + (8 mgm. bilirubin); bleeding time 3 min. 45 sec.; coagulation time 1 min. 5 sec. (good clot); Wassermann reaction negative. Blood grouping: Group A.

Urinary examination: Urobilinogen = 1·5 mgm. (100 c.c. of urine).

Discussion.—The PRESIDENT thought this fell into the group now known as erythroblastosis and asked whether Dr. Snell agreed.

Dr. REGINALD LIGHTWOOD said that this patient should be classified as coming within the group "erythroblastosis fœtalis" and it belonged to the least severe sub-variety, i.e. anæmia hæmolytica neonatorum [1]. Professor Parsons called these cases "erythronoclastic anæmia of the newborn". The slowness of the recovery in this instance was probably due to the fact that the marrow had been considerably damaged and time was therefore necessary before signs of improvement were apparent. Sometimes, in cases of this kind, recovery of the marrow was long delayed and occasionally failed to occur.

Reference.—[1] HAWKSLEY, J. C., and LIGHTWOOD, R. (1934), *Q.J.M.*, n.s., **3**, 155.

Dr. RONALD MACKEITH said Dr. Snell had suggested that the failure to cure with transfusions of the parents' blood might be due to that being deficient in some factor. He (Dr. MacKeith) had, however, frequently given transfusions (of citrated blood) from donors other than the parents, but with no greater success than that obtained by the use of the parents' blood. The onset of improvement seemed to come quite spontaneously. He knew of a case in which the anæmia had persisted for some five months, necessitating repeated transfusions, and had then rapidly cleared up, shortly after the child had failed to attend for a transfusion considered to be urgently needed.

POSTSCRIPT.—Since the meeting the blood picture has remained practically the same as that shown in the last column of the table.—[T.B.S.]

Section of the History of Medicine

President—A. P. Cawadias, O.B.E., M.D.

[*October 5*, 1938]

An Outline of Dentistry in the British Army, 1626 - 1938

By Major S. H. Woods, O.B.E.

(*The Army Dental Corps*)

Chronology

1617 : *Surgion's Mate*, John Woodall ; dental instruments in surgeon's chest.
1626 : War with France—Woodall medical adviser—his chest becomes regulation pattern for the army—July 10, Charles I authorizes free issue of chest—first authorized dental outfit for temporary army surgeons and mates.
1626–1695 : Musketeers (two-thirds of infantry) require incisors to open the bandoleer (powder charge).
1628 and 1639 : Woodall's *Viaticum* giving uses and illustrations of the dental outfit for the army surgeon.
1660 : Standing army formed—regular surgeons and mates—no details of instruments in chest.
1676 : *Eight Chirurgicall Treatises*, Richard Wiseman—first recorded gunshot wound of jaw (1650).
1678–1810 : Grenadiers (one company per regiment) require incisors to open the fuse of the grenade.
1696–1865 : The cartridge (combining charge and bullet) supersedes the bandoleer—all infantry required incisors and canines to tear open the cartridge.
1798 : Hospital equipments laid down—one dental instrument.
1816 : Report on Maxillo-Facial Injuries at Waterloo.
1820 : Three dental instruments in equipment.
1821 : Defective teeth as a cause of rejection.
1830 : Odontalgia as a cause of admission to hospital.
1838 : Four tooth instruments.
1857 : Medical officers supplied with sets of extracting and filling instruments ; requested to conserve teeth.
1878 : Gutta-percha splint for fractured jaw added to equipment.
1880 : British Dental Association formed—agitates constantly for army dentistry, but without success.
1899–1902 : South African War.
1900 : Mr. N. Pedley, honorary dentist at Deelfontein, for six months.
1901 : Four contract dentists for troops in the field. First issue of tooth-brush.
1903–1908 : Dentistry course to R.A.M.C. officers—instituted at Guy's Hospital. Clinical teachers in dentistry appointed.
1904–1908 : Eight contract-dentists appointed for army in home commands.
1909–1914 : Whole-time dentists superseded for part-time civilian contract.
1910–1914 : Three contract-dentists for British troops in India.

1914–1918 : The Great War. Slow recognition by authorities of the need for dental treatment at home and in the field ; May 1918 Lt.-Col. Helliwell appointed to War Office in advisory capacity.
1921 : January 4—The Army Dental Corps formed.
1932 : Standing Army Advisory Committee on Maxillo-Facial Injuries formed.

PREVIOUS to the formation of the standing army in 1660, forces and their medical staff were raised under a system of contract for the duration of campaigns, men being

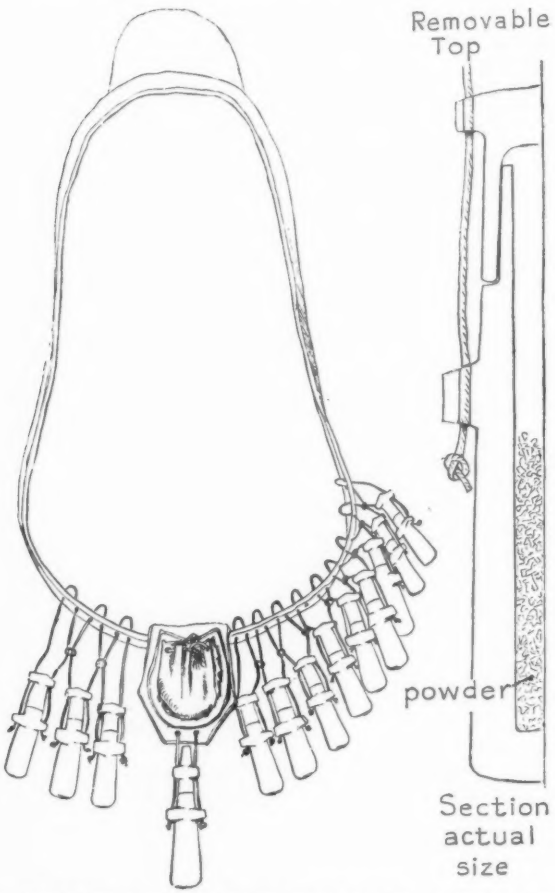


FIG. 1.—Bandoleers, shown in the cluster and full size. *c.* 1640. (From *T*
British Army. Scott, 1868.)

roughly graded by physique for the various arms of the time. The infantry unit early in the seventeenth century was the company, 100 to 300 strong, one-third pikemen and two-thirds musketeers, the latter carrying the gunpowder charge in bandoleers—wooden tubes, four inches long, attached to a shoulder strap (fig. 1).

We read " It doth behove musquettiers to be strong and puissant of body, without sickness, achs, or other impediments " (Scott, 1886), but we are not told that it also behoved them to have front teeth wherewith to pull off the bandoleer cap before pouring the powder down the muzzle. The use of incisors and canines as the quickest and simplest means to free the powder in the charge lasted till 1865, when the modern pin-firing mechanism was introduced, and for two centuries the possession of sufficient teeth for the purpose was the infantry dental standard, if we may call it such.

A surgeon and apprentice, styled " mate ", were allotted to each infantry company, the former supplying his own chest of instruments and dressings, for which he received additional pay of twopence a month from each man. In his *Surgion's Mate*, 1617, John Woodall, first Surgeon-General to the East India Company, details the contents of the chest required by the Company's surgeons, which soon became the regulation pattern for the forces and which Charles I, by Order in Council of July 10, 1626, authorized as a free issue by way of special inducement to surgeons to join his expedition against France. Woodall (appointed medical supervisor to the force) in a recruiting circular to " the younger sort of surgeons, my brethren " acquainted them of this Order by which the King not only increased the pay and field allowance of the previous reign, but " His Majestie moreover allowed and gave to each surgeon appointed to 250 men a surgery chest of £17 valew, free of account " (Gore, 1878).

We may therefore consider the instruments specified " for teeth " as the first authorized dental outfit (fig. 2).

FIRST AUTHORIZED ARMY DENTAL OUTFIT—JULY 10, 1626 (CHARLES I).

Instruments	Modern counterpart
Paces	Crown forceps
Pullicans	Dislocating forceps
Forcers	Elevators
Punches	Chisels
Crowes bills	Root forceps
Flegmes	Periosteal elevators
Gravers	Scalers
Small files	Similar

Their uses are described, and some of them are illustrated, in Woodall's *Viaticum, or Pathway to the Surgeon's Chest*, 1628, " containing chirurgicall instructions for the younger sort of surgeons in His Majestie's emploie ", in which he tells us :—

" All these recited instruments, and each of them, are needfull in the surgeons chest, and cannot bee well forborne for the drawing of teeth, forasmuch as the cleansing of the teeth and gums, and the letting of the gums' bloud are often no small things for keeping men in health, and sometimes doe save the lives of men both at sea and land. For we see that from an Apostume begun under a rotten or hollow tooth, for want of drawing of the same, sometimes proceedeth great swellings in the face, or in the Amygdals and throat, and the party is suffocated and dieth."

Hence we see that scaling and gum treatment, in addition to extraction, were performed by the company surgeon, and we note the mention of extensive caries, with cellulitis of the face and fatal angina as complications of acute alveolar abscess.

On the downfall of the Commonwealth in 1660, the various forces in the three kingdoms, numbering some 80,000 men, were entirely disbanded, and a small standing army of about 5,000 was formed under Charles II. The temporary company surgeon was replaced by a regimental " chirurgeon " permanently attached to the regiment, supplying a chest of which no details are available but in which some dental instruments were included, no doubt.

Richard Wiseman, " the Father of English Surgery ", and most noted military surgeon of the Restoration, gives us two important army cases and also a vivid picture of oral surgery at that time, in his great work *Severall Chirurgicall Treatises*, 1676.

" One was shot in the Face betwixt the Nose and Eye on the right side into the Ethmoides by Pistol-bullet. After he had been cured some years of the external wound in his Face, he became troubled with a fretting Ichor, which discharged by that Nostril ; and especially at his first rising

A NOTE OF THE PARTI-
cular Ingrediences due to the Surgeons
Cheſt, and of other neceſſary Appendexes
ſeruing for Chirurgicall vſes, whereof theſe next
recited may be placed on the lidde of the Cheſt,
if the Surgeon will haue it ſo.

Incision knives.
Dismembring knives.
Catlings.
Rasors.
Trapans.
Lenatories.
Head-Sawes.
Dismembring Saws.
Dismembring Nippers.
Mallet and Chizell.
Speculum Oris,
Speculum Oris with a Screw.
Speculum Linguæ.
Speculum Ani.
Cautrizing Irons.
Storks bills.
Rauens bills.
Crowes bills.
Terebellum.
Incision ſhieres.
Probes or ſtamules.
Spatulaes great and ſmall.
Spatulum Mondani.
For teeth. *Paces.* *Pulicans.* *Forcers or punches.* *Crowes bills.* *Flegmes.* *Grauers.* *Smail files.*
One bundle of ſmall German Inſtruments.
Gliſter Syringes.
Small Syringes.
Catheter.
Waxe Lights.
Theſe for the lidde of the Cheſt.

A The

FIG. 2.—Page 1, *Surgion's Mate*. Woodall, 1617.

in the morning out of Bed it would run half a spoonful of a yellowish colour, which had made a chop or gutter at the lower end of that Nostril by its acrimony. After some years he felt, upon bending his head backward or forwards, the Bullet to rowl to and fro over the roof of his Mouth. He complained to me of his grievance at the Hague in Holland, a little before his Majesty's going into Scotland. We resolv'd Upon the cutting thro' the Palat-bone, to which purpose I placed him in a clear light, one holding his head steady, while I cut into the roof. But the flesh was so close

tied to the bone that it would not yield to my Spatula as I expected ; wherefore I applied a bit of a Caustick-stone, and held it to the place with a pledget of lint a few minutes ; by which I consumed the soft fleshy part over the bone, and afterwards cut into the bone such a hole, that in the moving of his head I could see the bullet lodged in the hole ; which encouraging us to proceed in our work, the bullet was afterwards taken out, and he eased of that discharge of matter which threaten'd a filthy carious ulcer. My attendance upon his Majesty into Scotland hindring my prosecution of that cure, I left him in the hands of a Chirurgeon there, and since have often seen him at Court. But the Ulcer did not close up with a Callus ; however the place is supplied by a small plate without offence."—Book IV : *Sinuous Ulcers in Gunshot Wounds.*

This case may be dated with some confidence, as having occurred in 1650, for Wiseman accompanied Charles, then Prince of Wales, from the Hague to Scotland in June of that year (*Dictionary of National Biography*, 1900). It probably refers to a royalist officer wounded in the civil war and subsequently attached to the Prince's retinue, and is the first recorded treatment of a gunshot wound of the jaws before the days of a standing army period. Of special significance is the mention of a prosthetic appliance subsequently used to close the resulting sinus into the antrum.

" An officer of the King's Regiment of Foot, marching at the head of his Company in a hot Summer's day, heated his blood and was seized with a pain in one of his teeth of the lower right Jaw. He sent for a Tooth-drawer, who pulling out the tooth breake the alveoli off from the jaw according to the length of it. . . . The neighbouring parts swelled and apostemated, and all his teeth and part of the alveoli cast off."—Book II : *Of Ulcers with Caries in the Bones.*

The unfortunate officer reported to Wiseman, apparently consulting surgeon to the army at the time, who first attempted to cure the condition by fomentation, irrigation, and drainage.

" We hoped the outward and inward swelling and discharge of matter would have lessened ; but they not yielding one jot to our endeavours, I laid open the Cheek from the Orifice I had enlarged forward along the Bone, with intention to take it out ; but it was so shut in, that I could by no means get it out, till with watchmakers files I cut through that Bone ; then the ends thrust out into his Mouth. These I pulled out ; they proved to be pieces of the Alveoli. Then I felt the Jaw itself arise ; and, considering that if it was loose it must out, I passed the end of my Probe under it ; whereupon it rose up, having been some while loose and was only held down by the aforesaid Alveoli ; which being removed, the Jaw came away without the least pain or one drop of Blood, he only crying out of his Ear, as if it had made a hole through there."—*Loc. cit. supra.*

" The jaw being extracted, the side was ready to fall in ; to prevent which I caused the patient to hold it stretched out with his fingers in his mouth and a looking glass held before him, that he might the better see to keep it more exactly even whilst I by agglutinative powders ' cum albumine ovi ' made a Crust upon the outside ; which with pastboard wet ' in aceto ' applied over it sate close to it ; and after it was dried kept that side of the cheek firm, and by bandage it continued so, he helping it as hath been above said. Whilst his chaps were thus bound up, I continued to wash his mouth with the decoction above said injected often in a day with a syringe by which means the ulcer was cleansed and cured, and disposed to a callus, which grew and hardened in less than twenty days so equal with the other, as without looking in his mouth it could not be discerned.—*Loc. cit. supra.*

As the King's Regiment of Foot was one of the earliest in the standing army, this case may be regarded as the first recorded dental extraction and we specially note : (*a*) Osteomyelitis with loss of right angle and vertical ramus ; (*b*) poroplastic splint to counteract the resulting displacement ; (*c*) complete bony regeneration following on Wiseman's correct surgical procedure.

In 1678, grenadiers were introduced, and were required to have incisor teeth to open the fuse of the grenade—another use of teeth connected with arms of the service till about 1810, when grenades were discontinued.

The words of command and precise movements for freeing the powder in the bandoleer and grenade in 1690 were as follows :—

Musketeers

Words of command	Explanation
No. 21 : " Open them with your teeth."	" Bring the charger to your Mouth, pulling off the Cap with your Teeth and the help of your thumb."
No. 22 : " Charge with Powder."	" Bring your charger to the Muzzle turning it up, pouring the Powder in the Barrel."

Grenadeers

No. 12 : " Open your Fuse."	" Bring the Grenade to your mouth with your Right Hand, tell 1, 2, open the Fuse with your Teeth."

(From *The Exercise of the Foot*, 1690.)

By the end of the century, pikemen had disappeared on the introduction of the bayonet, and the bandoleer had been displaced by the cartridge in which the powder and bullet were combined, thus greatly simplifying the loading of the musket. Thereafter, the whole of the infantry bit cartridges (fig. 3).

FIG. 3.—" The biting of the cartridge ", from *The Soldier's Companion*. Lond., *c.* 1740.

Word of command	Explanation
"Handle Cartridge."	First movement : " Draw the cartridge from the pouch." Second movement : " Bring it to the mouth, holding it between the forefinger and thumb, and bite off the top of it."

(From *The Soldier's Companion*, *circ.* 1740.)

The eighteenth century is a barren period as regards our subject, for no records were kept; only a few army surgeons published their experiences or cases, and none of these refer to dental treatment or gunshot wounds of the jaws. Men were billeted in the garrets of lodgings or ale-houses, while £30 per annum was allowed the regimental surgeon for the hire of accommodation for a so-called hospital.

In 1740, only two barracks were in existence in England but, by 1798, barracks sufficient to house some 20,000 men had been built and a hospital organization was instituted, with definite schedules of equipment including dental instruments. At the same time, instructions for the medical examination of recruits were introduced, but it was not till 1821 that defective teeth were mentioned as a cause for rejection, previous to which the non-medical recruiting staff were responsible for ensuring that the infantry recruit could bite a cartridge. Napoleon did not leave so important a matter to chance, for his Code for Conscription, 1810, gives precise instructions on this point (Table I).

TABLE I.—THE DENTAL STANDARDS, 1625 TO 1938.

1625–1695 : Incisors and
1678–1810 : canines were
1695–1865 : required by

- Musketeers (two-thirds Infantry) to open the bandoleer (powder charge).
- Grenadiers (one company) per regiment to open the fuse of the grenade.
- Whole of Infantry, to open the cartridge (combining powder-charge and bullet).

1798 : First instructions for medical inspection of recruits.

1821 : First mention of defective teeth as a cause of rejection (Hospital Regulations). " Deficiency of many teeth, and particularly if accompanied by an unsound state of the remainder."

1824–1865 : " Loss of many teeth, particularly of the incisors and canines."
(Compare Napoleon Code of Conscription, 1810, " Loss of the incisors or canine teeth of the upper or lower jaw hindering the biting of the cartridge. A person without canine or incisor teeth cannot be a soldier of the line, but may be employed in other services ".)

1865–1898 : " Loss of many teeth."

1899 : " Recruits must possess a sufficient number of sound teeth for efficient mastication."

1906–1914 : " Loss or decay of teeth to such an extent as to interfere materially with efficient mastication."

1921–1936 : " The eleven-point standard "—a simple, practical guide for medical officers :—

sound or reparable functional
- incisors, canines, and premolars, count as one point each.
- first and second molars as two points each.
- third molars (according to development) as one or two points each.

Maximum possible points, 22.
Minimum points required, 11—namely 50% masticating efficiency.

1937 : The standard was modified for other than front-line troops.

1938 : All standards in abeyance.

In 1830, a category of causes of admission to hospital was introduced, in which " odontalgia " is included, suggesting that painful dental conditions were then common. In 1857, medical officers were requested by the Director-General, Army Medical Department, to conserve certain teeth rather than extract them in every case (*British Journ. Dent. Science*, May 1857) for which purpose the set of filling instruments shown in fig. 4 and detailed in Table II was authorized.

Even in the most skilled hands, this set was ridiculously inadequate for any useful purpose, and medical officers very wisely refrained from using it, hence there is no

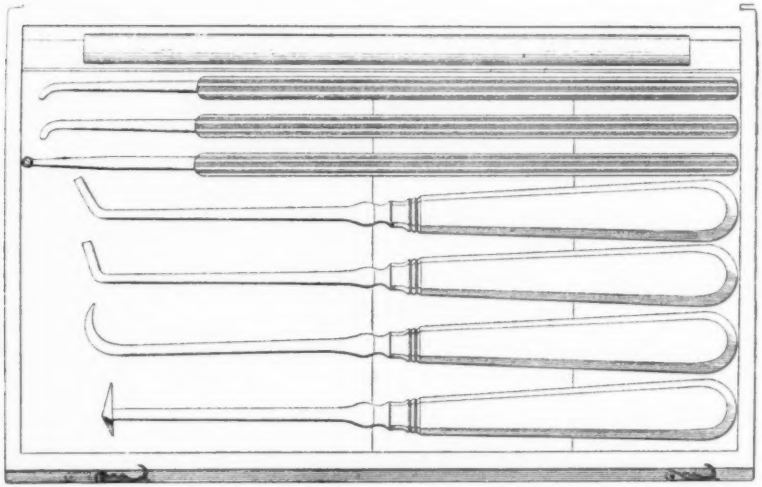


FIG. 4.—Set of instruments, stopping and scaling, 1857, illustrated in *Army Medical Equipment*. 1866.

record of the conservation of teeth in the army previous to the employment of dental surgeons in 1900 (Table III).

TABLE II.—REGIMENTAL HOSPITALS. AUTHORIZED DENTAL EQUIPMENT, 1798–1900.

1798–1820 : 1 key instrument for teeth, to fit trephine handle

1820–1838 : 1 key instrument
1 tooth forceps
1 tooth lever

1838–1857 : 1 tooth key
2 tooth forceps
1 punch
1 gum lancet

1857–1900 :

Set of extracting instruments :—
4 upper forceps, 4 lower forceps
4 forceps for children
1 set of six elevators to fit one handle
1 tooth key with three claws
1 spring gum lancet

Set of stopping and scaling instruments (fig. 4) :—
2 stoppers
2 scalers
2 excavators
1 rosehead
sheets, gold leaf
amalgam
gutta-percha

TABLE III.—DENTAL TREATMENT.

1626–1660 Pre-standing army	Extractions Scalings Gum treatments	by Company-Surgeon—expected to be able "to draw a tooth well". (Woodall.) by Mate—expected to be "not ignorant of tooth drawing".
1660–1900	Extractions only by regimental surgeons or mates.	
S.A. War—		
1900 (March–August)	General treatment by Mr. N. Pedley, Honorary Dental Surgeon, Imperial Yeomanry Hospital, Deelfontein.	
1901–1902	General treatment (except dentures and repairs) by 4 contract army dentists in the field.	
1903–1908	Conservative treatment by 8 contract army dentists in home commands.	
1909–1914	Limited conservative treatment by part-time civilian contract.	
India—		
1910–1914	Conservative treatment by 3 contract army dentists.	
1914–1921	All necessary treatment by temporary army dental officers.	
1921–1938	All necessary treatment by The Army Dental Corps (the first regular dental officers).	

In 1860, dentistry became a separate profession and in 1880 the British Dental Association was formed, agitating from its inception for some measure of dental treatment for the soldier, but without success.

Meanwhile, wounds of the jaws and face by cannon, gunshot, sabre, and lance, were becoming increasingly frequent in the various campaigns, attracting the attention of army surgeons, a few of whom published their experiences of such cases (Table IV).

TABLE IV.—OBSERVATIONS ON MAXILLO-FACIAL INJURIES (19TH CENTURY).

(1) *Report on the Wounded at Waterloo*, by John Thomson, Surgeon to the Forces, 1816.

"Musket-balls seldom enter the mouth without fracturing the jaws, several cases of which were seen. In passing through the upper part of the mouth, the balls had not only fractured the upper jaw, but they had also destroyed portions of the palate and removed the partition dividing the mouth from the nose. Fractures of the lower jaw, upon one or both sides, were very common. Few of these ever heal without distortion of the face; tedious exfoliations of bone take place and the fractured extremities occasionally show no disposition to unite by callus."

It would appear that, at this time, cases were more or less left to Nature.

(2) *Principles of Military Surgery*, by John Hennen, Deputy Inspector of Military Hospitals, 1818.

"It is astonishing how little beyond simple dressing is required in the most serious looking penetrating wounds about the mouth and cheeks, but it becomes a very different matter if the bone, particularly the lower jaw, is fractured or has sustained a loss of substance. The powerful and opposite muscles inserted into it render it difficult, if not impossible to prevent great deformity. If the bone is divided into two portions, apply the lower jaw closely in contact with the upper, which must be viewed in the light of a fixed splint, supporting the part by a properly adapted roller over the fractured points. The patient must keep his mouth closed and his food must be altogether fluid. Loosened teeth form a great source of irritation, and should be removed as soon as possible, for I have never seen the attempt to save them productive of ultimate good."

(3) *The Surgeon's Pocket Book*, by Surgeon-Major J. H. Porter, 1875.

In the chapter on wounds of the face and adjacent parts, he mentions—

Upper jaw: Replacement of fragments as far as possible; cold water dressings; approximation of soft tissues with adhesive plaster.

Lower jaw: More numerous and troublesome; difficulty of reducing displacement and maintaining position; difficulty of feeding and incessant flow of saliva.

Treatment: Gutta-percha splint; four-tailed bandage; ligature of contiguous teeth with silver wire or silk; bandaging combined with open wedging of posterior fragments; fluid diet through long tube; morphia.

TABLE IV (*continued*)

Description of case.—" At Redan in 1855, an officer received a bullet wound at the ala of the right nostril, which smashed most of his teeth in both jaws, broke in the hard palate, lacerated the tongue extensively, and broke the lower jaw in several places. His condition was that of extreme wretchedness, but by adjustments of the parts, removal of splinters and support by means of the gutta-percha splint, he was made comparatively comfortable. Suppuration was profuse and the wounds remained open for a considerable time, but he so far recovered as to be able to perform the duties of a field officer, having had a false palate and several teeth adapted to his mouth."

In 1878, a sheet of gutta-percha for moulding round fractured jaws was added to the equipment in the field, and medical officers were trained in its use at the Army Medical School, Netley, during the course in military surgery.

At the outset of the South African War in October 1899, no provision was made for the dental treatment of the force in the field. Mr. Newland Pedley, on the staff of Guy's Hospital Dental School, went out in February 1900, for six months, as honorary dental surgeon with the Imperial Yeomanry Hospital, Deelfontein (founded by voluntary subscription), and he was the first dentist to treat the soldier in war.

The British Dental Association, perturbed by reports of serious dental sick-wastage, approached the War Secretary, who was sufficiently impressed to appoint four contract dentists for the troops in 1901—the first paid army dentists (Table V).

TABLE V.—DENTAL PERSONNEL, SOUTH AFRICAN WAR.

Report by Mr. N. Pedley, Honorary Dental Surgeon, Yeomanry Hospitals, March–August 1900.

(*a*) " Disease, neglect, tough beef and hard biscuit play havoc with the teeth."

(*b*) " Nothing is done to preserve the soldier's teeth whilst he has any, and when they are gone, he must go home as a man unfit for service."

(*c*) " Had very few severe gunshot cases which were treated in conjunction with Mr. Alfred Fripp (consulting surgeon)."

The First Paid Dental Surgeons to treat Troops in the Field, 1901.

J. K. Clark (Bloemfontein).
E. W. Corfe (Elandsfontein).
J. B. Gillies (Norvals Point).
W. B. Woodhouse (Pretoria).

No army status—pay, £1 a day and captain's allowances—supplied own filling instruments—Government supplied necessary furniture and materials.

Report of these Four Dentists on Return from the S.A. War.

(*a*) No mechanical appliances were supplied in the outfit, hence no dentures could be made or repaired.

(*b*) Most extractions without anæsthetic—when required, chloroform was administered by an army surgeon.

(*c*) Last drafts sent out had extremely defective teeth—most of these men were useless as fighting units, being unable to masticate the diet of tough meat and hard biscuits.

TABLE VI.—OFFICIAL STATISTICS—SOUTH AFRICAN WAR, 1899–1902.

Dental Report.

" There was among men with the Colours not only a considerable prevalence of dental caries, but a septic condition of the mouth was almost more common.

Caries of the teeth and its accompaniments, including pyorrhœa, was much more important than is shown by the admissions to hospital, and was a very serious matter in relation to inefficiency.

Of 6,942 admissions to hospital for caries, etc. about one-third were invalided to England, the remaining two-thirds were nominally returned to duty, but many of them were unfit for duty in the field and had to be kept within reach of soft food."

Dental Sick-wastage, South African War.

Average ration strength in the field	Number of admissions to hospital for dental disabilities	Number of these invalided to England as unfit for service
208,300	6,942	2,451 (1·2% of total effective force)

After the campaign, eight whole-time army dentists were appointed to the home commands, but were superseded in 1908 by a system of local part-time civilian contract. As for India, where the British troops had been neglected, three whole-time contract dentists were appointed in 1910 (Table VII).

TABLE VII.—DENTAL PERSONNEL, 1904–1914.

First Dental Surgeons to Treat Troops in Peace Time. April 1904 *to March* 1908.

(Home Commands Only.)

J. K. Clark, Aldershot	J. B. Gillies, Dublin
C. de Foubert, Cork	H. G. H. Cowell, Edinburgh
A. Rice, Woolwich	C. W. Randall, Colchester
A. F. A. Howe, Portsmouth	H. C. Toone, Devonport

Contract—£1 a day and travelling expenses—no rank or army status—no uniform—supplied with up-to-date equipment. Estimated cost, £5,000 per annum.
They were superseded in 1908 by local civilian part-time contract.

First Dental Surgeons for British Troops in India, 1910–1914.

J. Carr F. Byrne J. P. Helliwell

Whole-time contract; conservative treatment only; no rank or army status.

Meanwhile, the army medical service had been reorganized, and dentistry was included in the subjects in which officers at the Royal Army Medical College, London, could be graded as "specialist" after taking a course in the subject. Accordingly, clinical teachers in dentistry were appointed, but only four "dental specialists" were graded in six years, and were not employed in such capacity. The scheme was abandoned in 1908 (Table VIII).

TABLE VIII.—COURSE IN DENTISTRY FOR R.A.M.C. OFFICERS, 1903–1908.

Clinical Teachers

1903, J. H. Badcock, F.R.C.S., L.D.S.
1904–1906, W. A. Maggs, M.R.C.S., L.D.S.
1906–1908, M. F. Hopson, L.D.S.

External Examiner

Mr. Paterson, M.R.C.S., L.D.S.

The Courses were given at Guy's Hospital Dental School.

The following were graded as "specialists" in dentistry:—
Majors J. H. Pocock; B. W. Longhurst; J. B. Cautley; H. C. Wentworth.

It may therefore be said that, at the outbreak of the Great War in 1914, dental treatment for the soldier was negligible. No provision whatever had been made for treatment in the field, and no dental officer accompanied the expeditionary force to France. As everyone knows, the authorities were lamentably slow to recognize the necessity of, and to make provision for, dental treatment at home and in the field. It was not till May 1918, when Major Helliwell, then Senior Dental Officer in the London District, was appointed to the War Office in an advisory capacity, with the rank of Lieutenant-Colonel, that anything like organized and effective measures were taken (Table IX).

One lesson of the war was that men dependent on dentures are potential inefficients, for dentures are so easily lost or broken, wilfully or accidentally. There was a constant stream of thousands of men from army areas to the base, for the fitting of new dentures and repairs—a wastage of effectives which seriously perturbed army commanders. This experience profoundly influenced subsequent army dental policy, and the denture question still remains a major problem of its own. Another

lesson of the war was the high incidence of wounds of the face and jaws in modern warfare, requiring specialized treatment by an organized maxillo-facial team of

TABLE IX.—NUMBER OF DENTAL OFFICERS, HOME AND IN THE FIELD, 1914–1918.

Year		
1914	August to October	None with Expeditionary Force
	November	12 for France only
	December	20
1915	February	36 (Including the first for Home)
	May	57
	August	150
1916	August	300 (Compulsory Service Act)
	December	463
1917	December	501
1918	May	(Lt.-Col. Helliwell appointed to War Office in advisory capacity)
	August	714
	November	850

(*Official Medical Statistics of the Great War*, 1931.)

surgeons and dental officers. An Army Advisory Committee was formed in 1932 to deal with all matters relating to this subject (Table X).

TABLE X.—ARMY ADVISORY STANDING COMMITTEE ON MAXILLO-FACIAL INJURIES, MAY 1932.

CONSTITUTION OF THE COMMITTEE

Chairman

Colonel J. P. HELLIWELL, C.B.E., Director, Army Dental Service, War Office.

Members

*Mr. W. KELSEY FRY, M.C., M.R.C.S., L.D.S.
Sir HAROLD D. GILLIES, C.B.E., F.R.C.S.
Mr. W. WARWICK JAMES, O.B.E., F.R.C.S., L.D.S.

Secretary

Major S. H. WOODS, O.B.E.

* Nominated by the British Dental Association.

TERMS OF REFERENCE

To investigate and report on the treatment of maxillo-facial injuries and to make recommendations in regard to :—

(i) the provision and equipment of special hospitals or departments for these cases;
(ii) general methods of treatment, and
(iii) the training of dental officers in the principles of preliminary treatment in the field.

(The Report made in June 1935 is an official publication.)

In the introduction to the Army Estimates for 1921, it is said that

" Sound teeth in the soldier are of prime importance and an army dentally fit will have reduced rates of sickness and invaliding. A proposal has, therefore, been put forward for the formation of a Dental Corps to consist of 110 officers and 132 other ranks (mechanics and orderlies) for which it is hoped approval will be obtained."

By Royal Warrant dated January 4, 1921, the Army Dental Corps was formed, under Lt.-Colonel Helliwell at the War Office, when, for the first time, an organized, comprehensive, continuous scheme of dental treatment became available to the soldier throughout his service.

TABLE XI.—TREATMENT BY THE ARMY DENTAL CORPS.

Recruits.

On joining, the recruit is inspected and he is rendered dentally fit during his three months' training, every effort being made to conserve defective teeth. A large proportion of the dental officers at home are detailed for this intensive treatment of the recruit.

Year	Number inspected	Number requiring treatment	Average requirement per man
1936	23,455	23,182 (99%)	2·5 extractions 4·5 conservations

Trained Soldiers.

The recruit joins his regiment as a trained soldier and is dentally inspected annually in March. Continuation treatment is given by the dental officer in the area to maintain dental fitness. All drafts for foreign service are inspected and rendered dentally fit prior to embarkation. Necessary dentures are supplied.

Year	Number inspected	Number requiring treatment	Average requirement per man
1936	139,004	75,850 (55%)	1·5 conservations

Year 1936. *Annual Dental Report.*

Teeth conserved ..	254,182	New dentures supplied	2,172
Teeth extracted ..	98,520	Dentures repaired	2,471
Scalings	42,978	Fractures of jaws	120
Gum treatments ..	2,706	Jaw appliances made ..	59

Personnel treated.—Officers; other ranks; families of soldiers; boys in technical schools; Royal Naval and Royal Air Force personnel at stations abroad.

TABLE XII.—THE ARMY DENTAL CORPS PERSONNEL, 1921–1938.

Year	Administrative officers (excluding a Director at the War Office)		Total establishment of officers
1921	4 Majors	(Joint service for Army and Air Force)	110
1930	4 Majors	Air Force section separated to form R.A.F. dental service	
1935 (September)	4 Lieutenant-Colonels		124
1935 (October)	2 Colonels 9 Lieutenant-Colonels		150
1938 (August)	Same		162

Normal Geographical Distribution (1938).

Home Commands ..	112	India	30
Gibraltar	1	Burma	1
Malta	2	Malaya	3
Egypt	7	Hong Kong ..	3
Sudan	1	North China ..	1
Palestine	1		

Summary: Home 112; abroad 50; total 162.

Other Ranks.

Dental mechanics.—These are trained at The A.D. Corps School of Instruction, Aldershot, in denture work and the making of appliances and splints for maxillo-facial injuries.

With exception of one small laboratory in the London district, all the denture work at home is undertaken at the Central Laboratory, Aldershot.

Abroad, mechanics are posted to command laboratories or to single dental centres.

Establishment (1938)—40.

Dental clerk-orderlies.—These are trained at The A.D. Corps School of Instruction, Aldershot, in the duties of surgery-attendant and clerk. 1 clerk-orderly is allotted to each officer.

Establishment (1938)—170.

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Section of Orthopædics

President—R. Ollerenshaw, F.R.C.S.

[*November* 1, 1938]

The Femoral Neck in Childhood

PRESIDENT'S ADDRESS

By Robert Ollerenshaw, M.D., F.R.C.S.

During the whole span of man's life the femoral neck is a vulnerable structure, but at no period is it more subject to various pathological changes than in infancy and adolescence.

During the past sixteen years, chiefly in my work at the Royal Manchester Children's Hospital, I have had opportunities of dealing with every variety of affection of the femoral head and neck in children. These include: (1) Rickets; (2) tuberculosis; (3) sepsis; (4) Perthes' disease; (5) fibrocystic disease; (6) dysostosis cleido-cranialis; (7) the changes in the femoral neck which are associated with congenital dislocation of the hip; (8) that type of coxa vara which, for want of a more scientific name, we call infantile coxa vara; (9) "loosened" and "slipped" upper epiphysis of the femur.

Those of the two last-named groups, infantile coxa vara, and "slipped" epiphysis, have been of special interest to me, and it is with those groups only that I propose to deal on this occasion.

I.—Infantile Coxa Vara

Summary.—A review of sixteen cases of the condition known as infantile coxa vara—The pathological changes are those of an "aseptic necrosis"—Operative treatment must be undertaken on the lines indicated—Apart from operation the outlook is extremely bad—Cinematographic records of six typical cases are presented, showing the results of treatment.

My personal cases number 16 in all. Ten of these were bilateral, and six unilateral. Nine were in males and seven in females. The average age of the whole group, when first seen, was 6 years, the youngest being 2 years and the oldest 11 years.

Clinical signs.—The clinical signs of this condition are: (1) A rolling gait; (2) lordosis, specially seen in the bilateral cases, of course; (3) raising of the trochanters; (4) loss of abduction; (5) complete absence of pain. A striking feature is the smallness in stature of all these patients.

British orthopædic surgeons have taken a prominent part in the investigation of the condition. Elmslie [1] separated this group quite definitely from other types of coxa vara. Fairbank [2] reported a series of 19 cases, in which 11 were unilateral, and eight bilateral cases, and in this group he drew attention to the X-ray appearances which distinguished them from all other forms of coxa vara.

Radiography.—Radiographically, the following conditions are found: (1) A clear area in the neck of the femur, quite distinct from the epiphysial line, and distal to it (Plate I, fig. 1); (2) the presence of a fragment of bone in the lower part of the clear area, the shape of this fragment being that of an inverted V; (3) a shortened neck; (4) a decreased angle between neck and shaft; (5) in some cases a

translucency of the femoral head; (6) in some cases there is an alteration in the shape of the acetabulum, there being a "shelving" of the upper part.

Ætiology.—Numerous suggestions have been made to explain the cause of this condition:—

Developmental error:

Beyond proof or criticism. There appears to be no hereditary influence.

Trauma:

There was a marked absence of any history of definite trauma in any of my series. The fact that the condition occurs bilaterally in such a large proportion of cases, or even that it occurs bilaterally at all, probably excludes trauma as a causation.

Rickets:

In none of my cases has there been any signs of rickets, and in all of them, other bones were investigated, and found to be normal.

Renal rickets:

In no case was there any sign, clinical or radiological, of this condition. None had albuminuria.

Local inflammatory changes:

The condition is an aseptic one. A slow necrosis followed by regeneration of bone is the only way in which we can describe the change. In this it resembles the process which occurs in pseudocoxalgia, in Kohler's disease, and in Keinböch's disease. It differs only in the fact that regeneration will not occur so long as weight-bearing takes place *across* the line of the femoral neck, and that it does occur when the upper end of the femur is re-aligned so that weight is borne *along* the line of the neck.

Calcium deficiency:

All the cases which I have seen occurred in patients of the hospital class. I have never seen it in a patient of a class which we might consider to be of the better-housed and better-fed type, but we have found no changes in the blood-calcium and blood-phosphorus of any of the series. The fact that in a large proportion of the cases the condition is unilateral is opposed to the likelihood of its being "constitutional".

Dysostosis cleido-cranialis:

I have seen many well-marked cases of dysostosis cleido-cranialis, but never in these have I seen an infantile coxa vara. Changes do certainly take place in the hips of children affected with dysostosis cleido-cranialis, but they are of an entirely different character. This is well illustrated in what is probably the most advanced case of dysostosis cleido-cranialis that I have encountered.

Two children, brother and sister, presented all the classical features of this condition, and it is obvious that although the upper ends of the femora are deformed, they do not in any way resemble infantile coxa vara. They show a large head and neck, with a diminished angle (Plate I, figs. 2 and 3).

It is interesting to note that in these children, although the bones are deficient in calcium, deposits in the skin and subcutaneous tissues of a substance containing 30% of calcium were found (fig. 4).

In the boy, now aged 14, there are large deposits lying in the situation where the clavicles should be, and numerous pieces of this calcium-bearing material are being extruded through the skin of his thumb and fingers (fig. 5).

The blood-calcium is 11·4 mgm. per 100 c.c., and the blood-phosphorus 3·7 mgm. per 100 c.c.

Progress.—The condition of infantile coxa vara in its very earliest stages presents small areas of rarefaction in the femoral neck. These increase in size rapidly, and coalesce so as to form the area which we usually find presented to us on the first

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PLATE I.

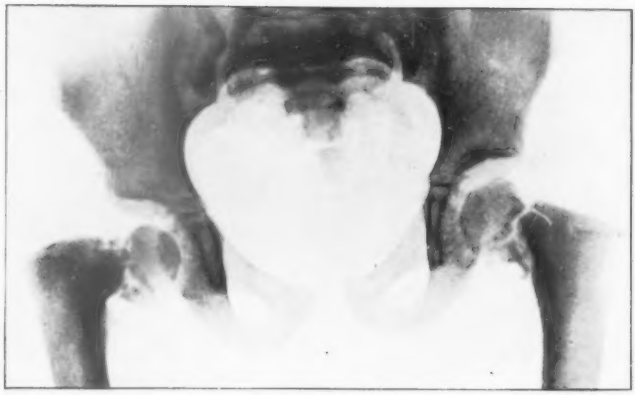


FIG. 1.

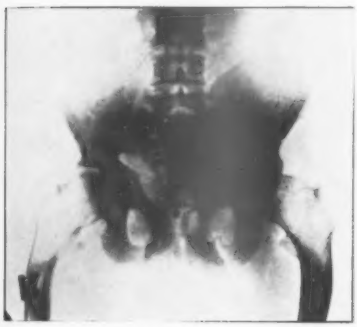


FIG. 2.

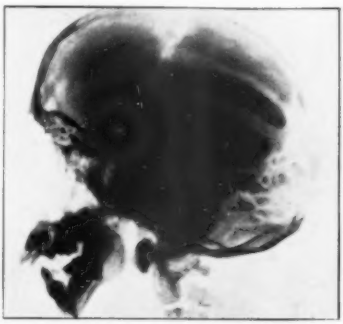


FIG. 3.

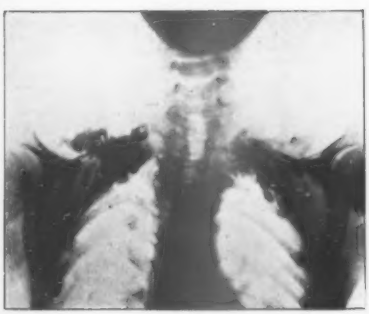


FIG. 4.

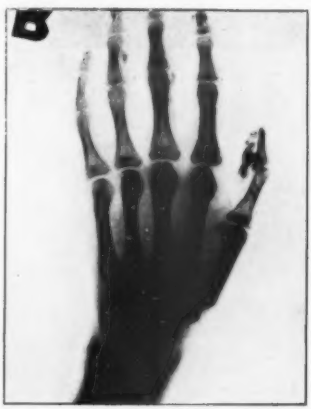


FIG. 5.

ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

PLATE II.

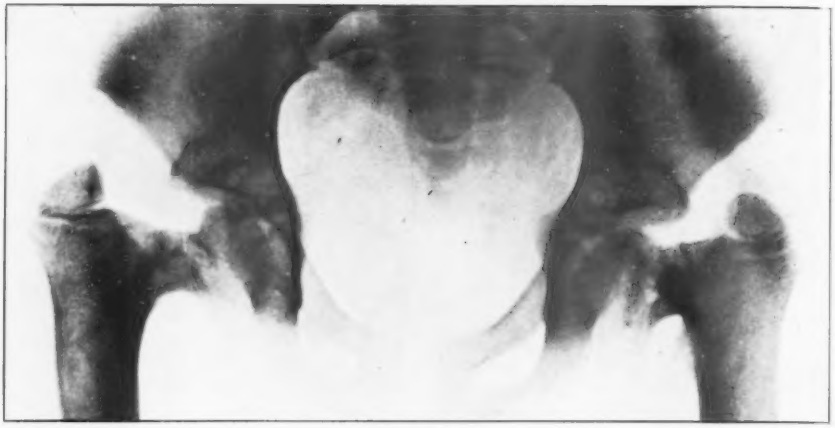


FIG. 6.

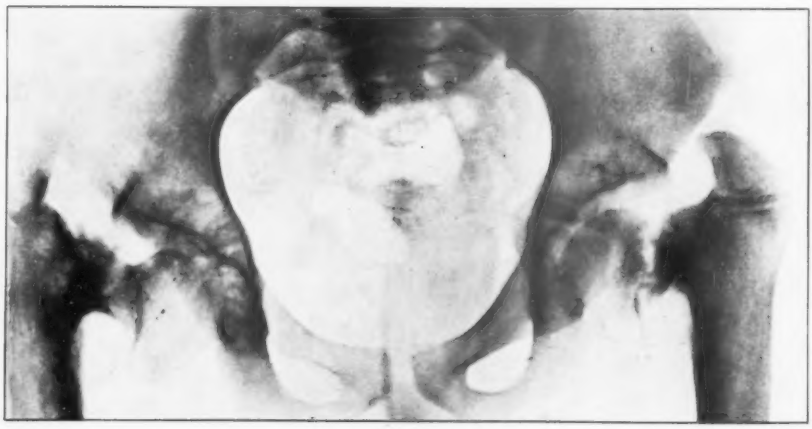


FIG. 7.

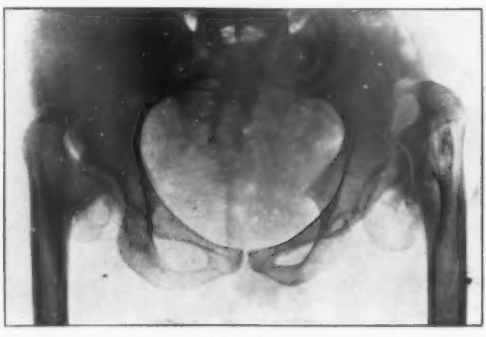
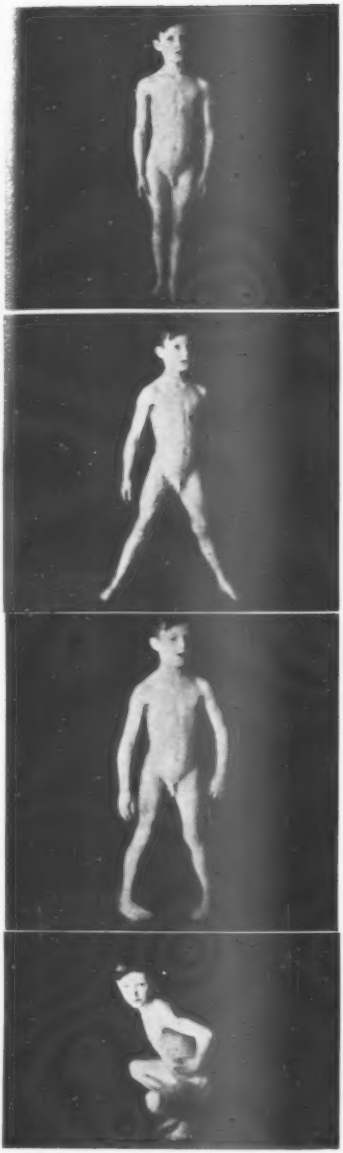


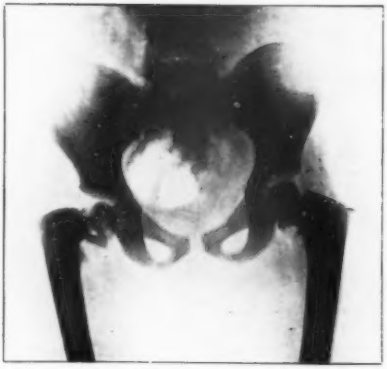
FIG. 8.

ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

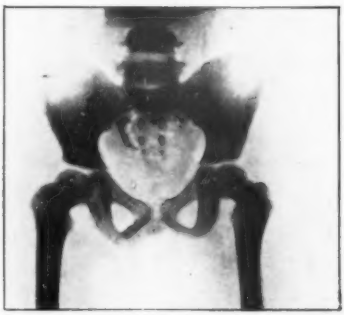
PLATE III.



"Still" photographs extracted from cinematograph film of present condition.



1934.

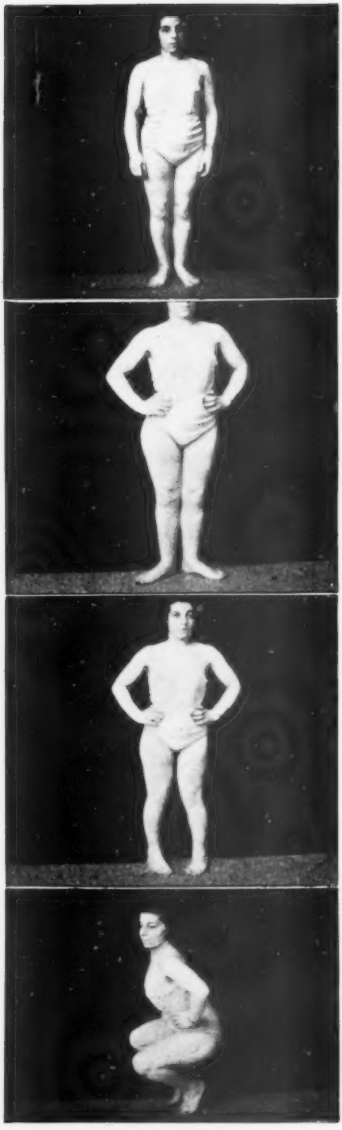


1936.

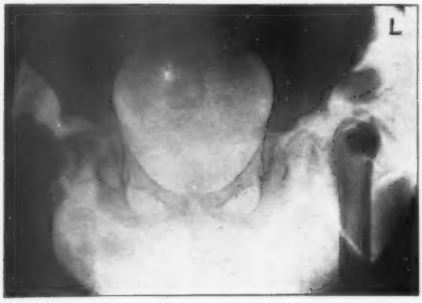
1938.

Case record No. 1.

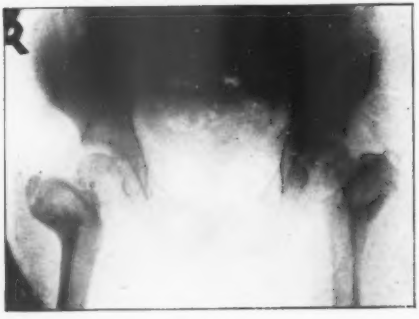
PLATE IV.



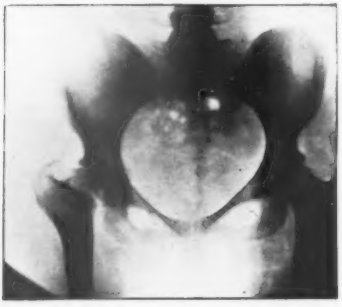
Present function.



1925



1927.

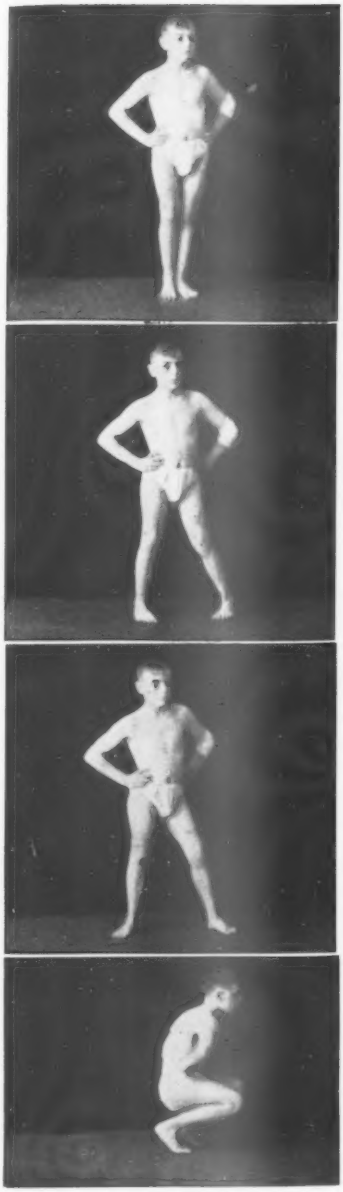


1938.

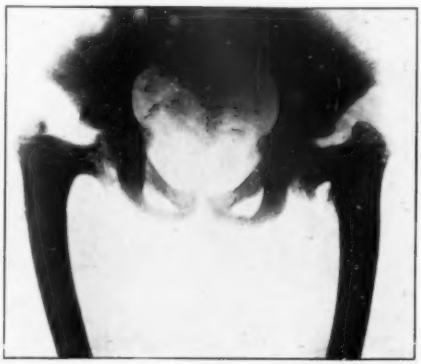
Case record No. 2.

ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

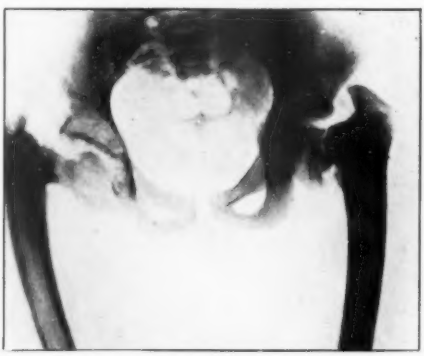
PLATE V.



Present function.



1933.



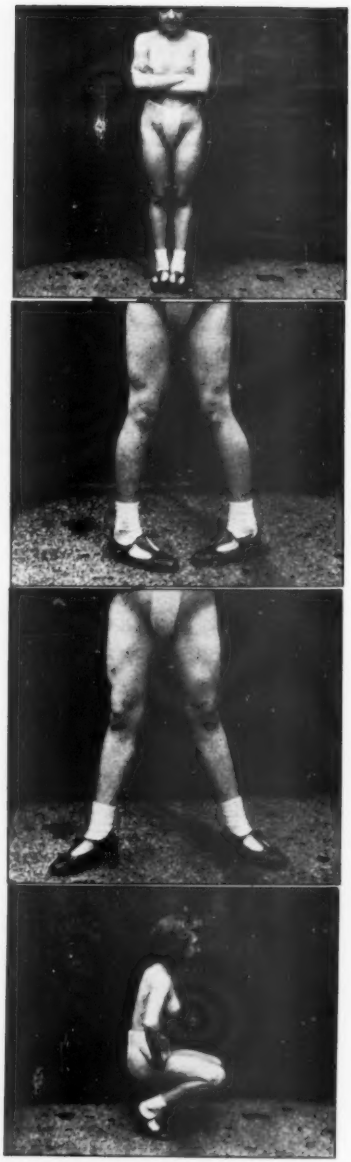
1935: Before operation.

1938: Right relapse.

Case record No. 3.

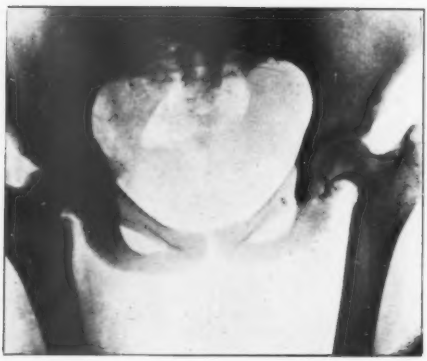
ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

PLATE VI.



Present function.

1932.



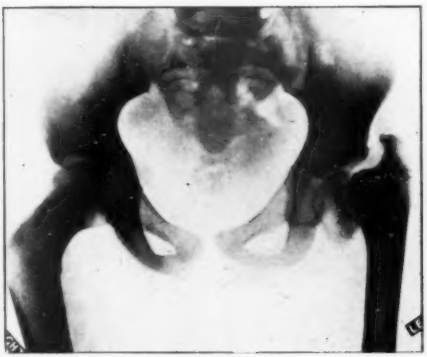
1938.

Case record No. 4.

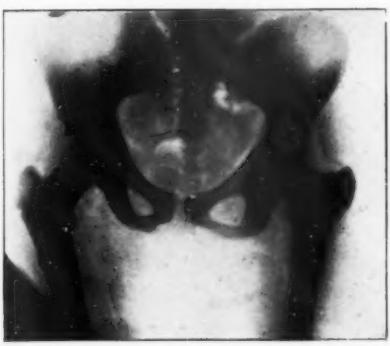
ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

PLATE VII.

Present function



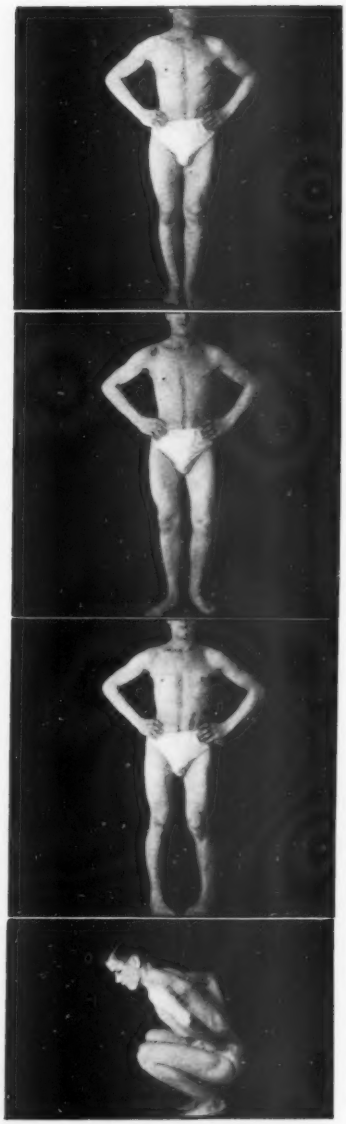
1932.



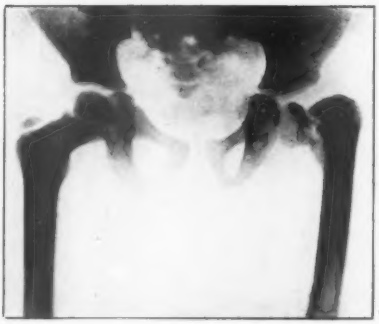
1938.

Case record No. 5.

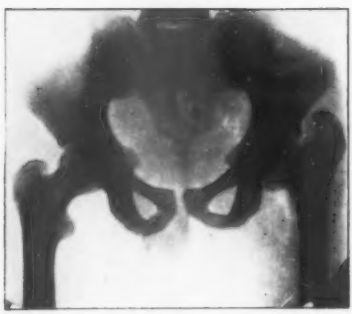
PLATE VIII.



Present function.



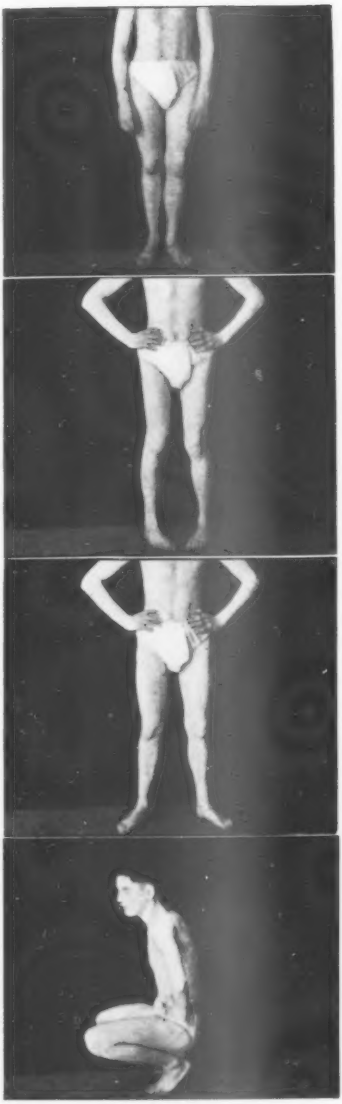
1930.



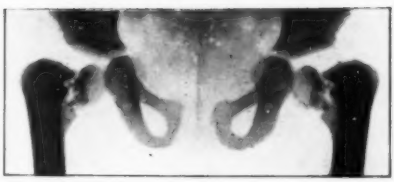
1938.

Case record No. 6.

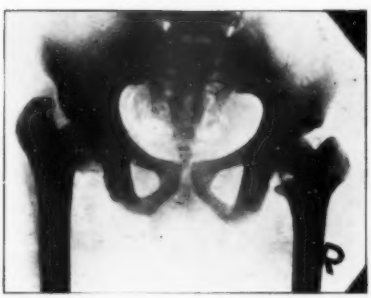
PLATE IX.



Present function.



1928.



1938.

Case record No. 7.

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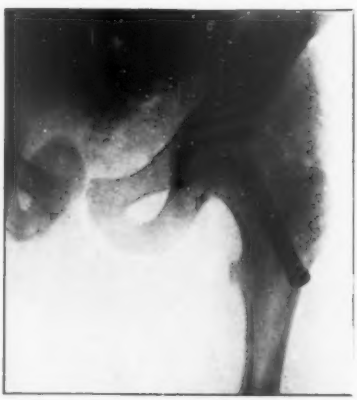
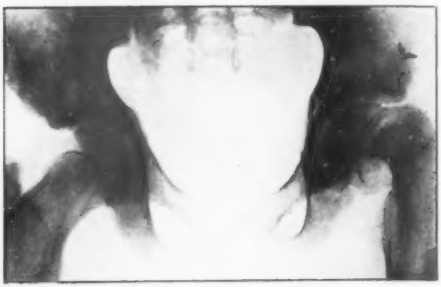
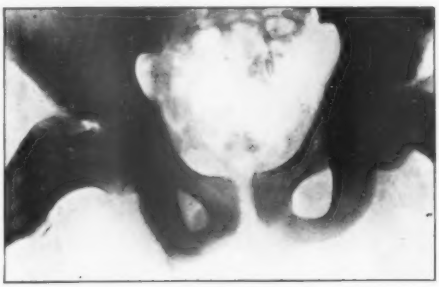


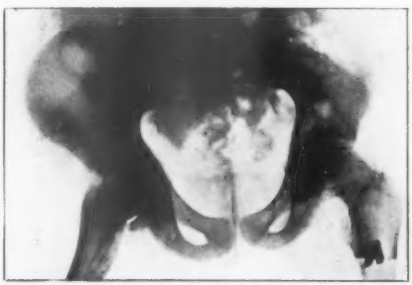
FIG. 9.—Fracture of the femoral neck in a boy aged 15 years.



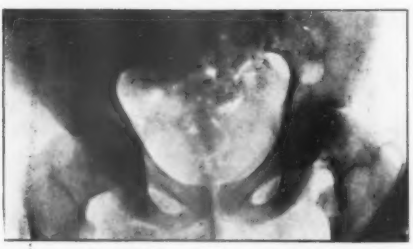
Right slip.



Reposition.



Left slip.



Reposition, right and left.

FIG. 11.—Radiograms of patient shown in fig. 10 c.

occasion on which we see the patients. I have never seen the very earliest stage, but I was told, when I was in Germany this summer, by Doctor Herzog [3] of Mohrau-Ostrawitz, that he had observed this earliest stage, and he offered to send me some radiograms showing it. Unfortunately he lives in the Sudeten area of Czechoslovakia, and the radiograms have failed to arrive. I am not, therefore, able to show this very early stage as I had hoped.

The condition rapidly becomes worse. A boy aged 6 years was brought to me in 1933 with the condition well marked on both sides. Operation was advised, but the boy failed to appear, and I did not see him again for two years. The condition had become much worse, and as will be seen from the radiogram, the heads of the femora were at least ¾ in. lower down than they had been two years before (Plate II, figs. 6 and 7).

The rolling gait and the lordosis were much more apparent, so that the degree of change in two years is obviously very considerable.

If these cases are not treated surgically, they go from bad to worse, and eventually end with the head of the femur several inches below its normal position, with almost no femoral neck at all, with complete inability to abduct, and with an extremely difficult gait.

Fig. 8 is an X-ray photograph of a youth aged 22, whose parents have steadily refused to allow him to have any kind of operative treatment.

Treatment.—Treatment consists of a wedge osteotomy, the wedge being sufficiently wide at its base to allow the femoral neck and the shaft of the femur to come into line. This necessitates a very wide abduction, and unless this apparently exaggerated abducted position is obtained, the operation may fail to produce its desired effect.

One or two writers on the subject have discussed this form of treatment, and one of them stated that he had the "general impression" that it was well worth doing, I am able to go much further than this, and to say that it is most essential to do it. and that a very good result can be obtained. After the osteotomy has been performed, the body-weight is carried almost vertically through the femoral neck, and not across it as before. The neck then becomes changed in character, and develops into a really bony structure.

In a few cases, however, it happens that a relapse occurs after weight-bearing has taken place. In two cases, in both of which the condition was bilateral, I have had a firm union on one side, and a relapse on the other side. When this occurs a second osteotomy should be performed on the relapsed side, and the process repeated.

One of the cases of relapse here illustrated shows that it is possible to get a good result on the relapsed side if it is dealt with on a second occasion. In the other case a second operation has been advised but, unfortunately for him, the patient has refused to have it.

I now show a series of slides illustrating the radiographic appearances of seven representative cases at various stages of treatment.[1] (Case records 1 to 7, Plates III to IX.)

II.—"Slipped" Epiphyses

Summary.—Consideration of a series of cases of slipped epiphysis—The condition is not due to trauma, but is due to disease chiefly concerned with endocrine imbalance—Union occurs by bone—After satisfactory reposition, the resultant shortening is very small—Manipulation and replacement of the normal position of neck and epiphysis, followed by plaster-fixation for three months, and subsequent prevention of weight-bearing for a further six months may be relied upon to produce a very large percentage of good results.

I now pass to the second group—the slipped epiphyses. I have had 22 cases of this condition, 12 being in males and 10 in females, all between the ages of 13 and 16 years.

[1] In each case the radiograms were followed by a cinematograph film showing the function at the end of treatment.

Trauma or disease.—I am in entire agreement with those who hold that slipping of the upper femoral epiphysis is the result not of trauma, but of disease. Experiments have been made by us to test the effects of force upon the femoral neck and epiphysial line in bones removed post mortem. With the help of Professor Wood Jones of Manchester University I have tested the effects of various forces on the epiphyses of fourteen- and fifteen-year-old femora removed post mortem from children who died of causes not related to bone diseases.

A steel pin 8 in. long and $\frac{3}{16}$ in. in diameter, was driven through the epiphysis, and the pin was fixed to the workshop bench. Abduction force was slowly applied to the lower third of the shaft. The amount of strain was carefully measured, and it was found that a fracture occurred at between 45 and 50 lb. With another femur, similarly fixed, a torsion force was exerted, and fracture occurred again when the strain had reached 45 lb. In both cases the fracture took place through the femoral neck distal to the epiphysial line, and the line itself remained unmoved.

It seems to be quite clearly established that trauma to the upper end of the femur will not produce a clean separation of a *normal* epiphysis. In 1932 Perkins [4] pointed out that the diaphyseal fragment usually seen in epiphysial separations is never found in slipped femoral epiphysis.

Prodromal symptoms.—In most recorded cases there is a clear history of symptoms of abnormality previous to the acute slipping. There is usually a statement of aching in the hip and intermittent limping.

Eight out of a series of nine cases recorded this year by P. D. Wilson [5] had a history of limping or pain over a period varying from five weeks to two years before the actual slipping occurred. Kocher, in 1894, expressed the view that a slow localized osteomalacia occurred.

The traumata which are often reported in cases of slipping of the epiphysis, are too trivial to produce even a fracture of the femoral neck—let alone to separate the epiphysis. In the case of a diseased epiphysial line, however, the normal body-weight alone is enough to cause a slip. Taylor [6], in 1933, in a consideration of 23 cases collected from various sources, considered that the action of body-weight produces its effect only after some other factor has started the diseased process.

In none of my cases had the patients suffered violence of real importance, and as a contrast I will show the radiogram of a youth of the same period of life (15 years) who fell heavily on to his left hip. He suffered a fracture of the neck, and was treated by the insertion of a Smith-Petersen pin in the customary manner (Plate X, fig. 9).

Various writers have made collections of cases from many sources, and reports differ quite widely as to the proportion of children who might be described as otherwise healthy. For example, only two cases of Fröhlich's syndrome out of 23 collected cases, were reported in the paper by Taylor, previously mentioned.

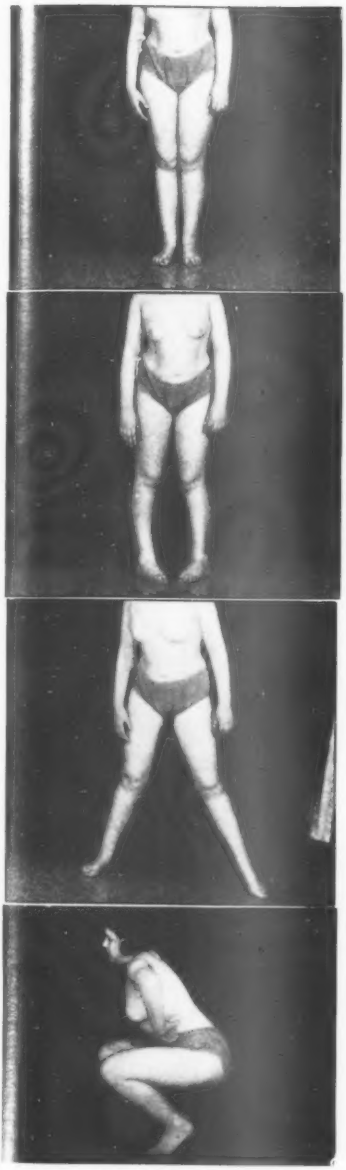
My patients, with two exceptions, were all *heavy* children, and 11 of them were definitely of the adiposo-genitalis type. Other observers have reported that 65% of their cases were of definite " Fröhlich's syndrome " type (fig. 10).

In this condition, post-mortem specimens are not available, and we must depend on clinical and radiographic observations.

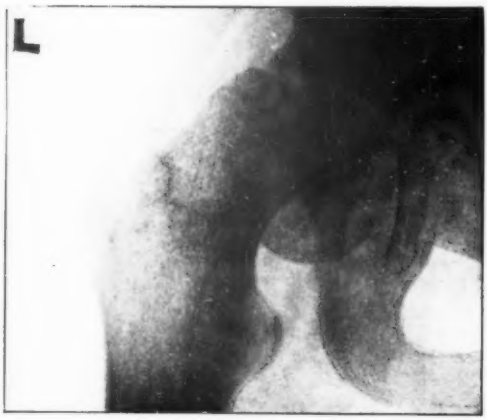
Age of union of upper epiphysis.—Most anatomical textbooks put the age of union of the upper epiphysis at 18 years. I believe that it is actually considerably earlier, probably 14–16 years. It is certain that very little growth takes place at the upper epiphysis after the age of 14 years. In 1924 Cohn [7], as a result of a study of a series of X-rays, fixed the age of union at 15 years.

Character of repair.—In my opinion, repair of a slipped epiphysis takes place always by bone. I say this for two reasons: Firstly, so far as I know, there is no recorded case of a slipped epiphysis giving way for a second time, after it has once united, and, secondly, in a case in which, because of gross displacement, I had to operate, I observed that the two separated surfaces contained bony elements, and it seemed certain that the union must be a bony repair.

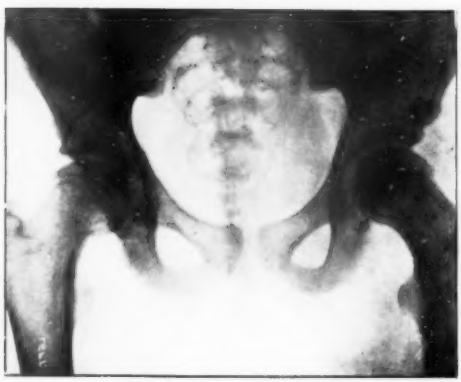
PLATE XI.



Present function.



1935.

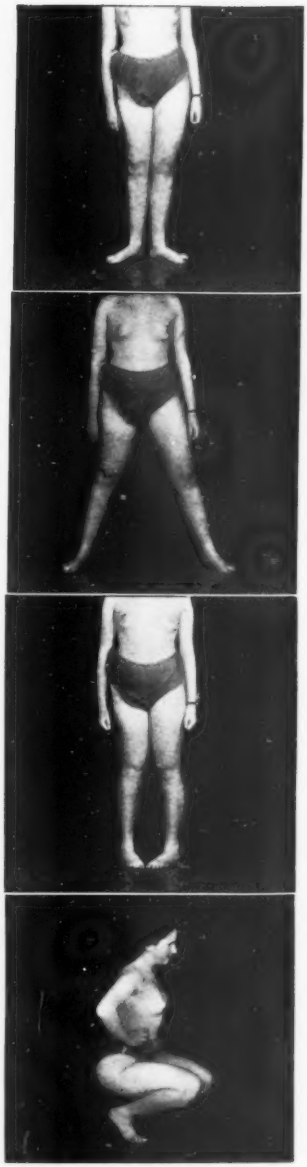


1938.

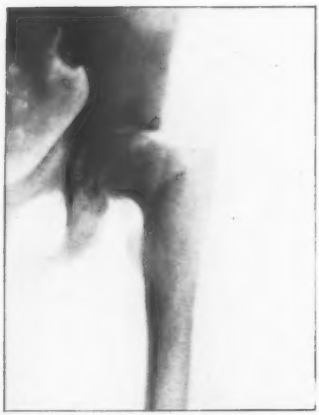
Case record No. 8.

ROBERT OLLERENSHAW: The Femoral Neck in Childhood.

PLATE XII.



Present function.



1934.

1938.

Case record No. 9.

ROBERT OLLERENSHAW : The Femoral Neck in Childhood.

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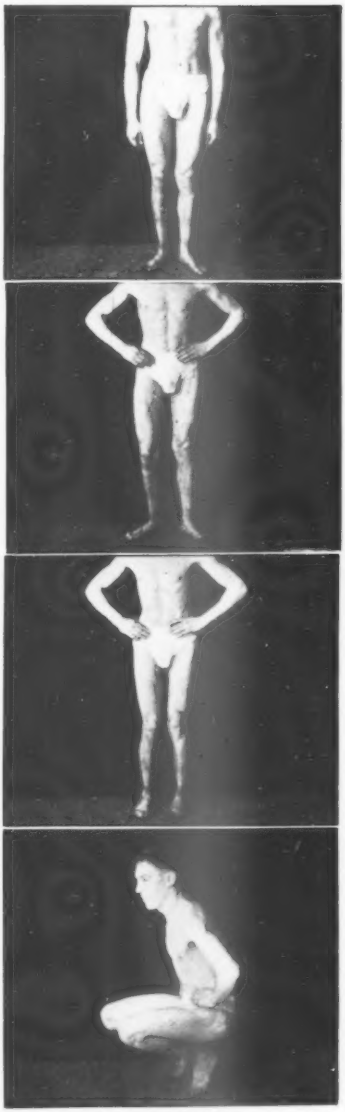
PLATE XIII.

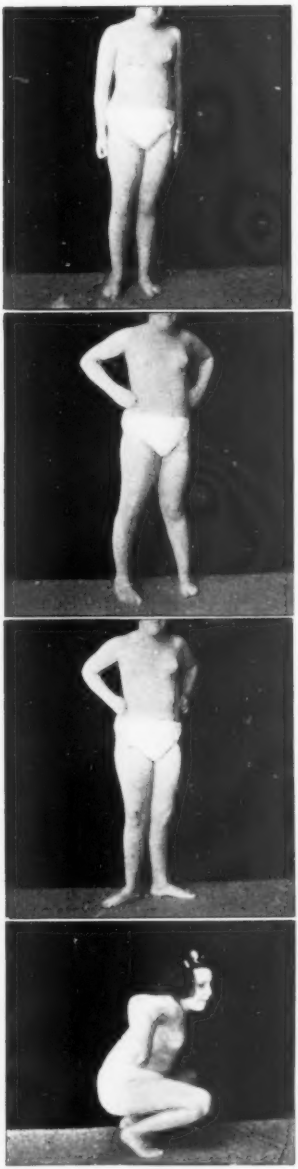


Present condition.

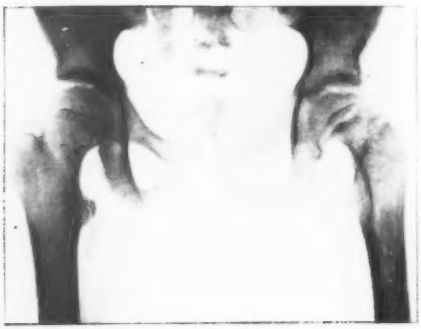
Osteotomy, 1932.

Case record No. 10.

PLATE XIV.

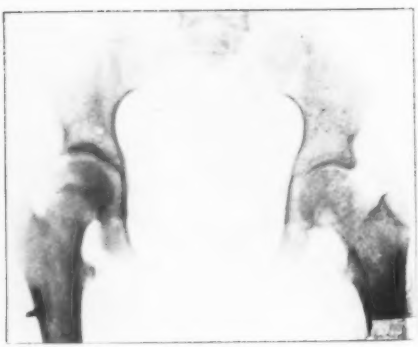


Present function.



1936.

1936, Reposition.



1938.

Case record No. 11.

ROBERT OLLERENSHAW : The Femoral Neck in Childhood.

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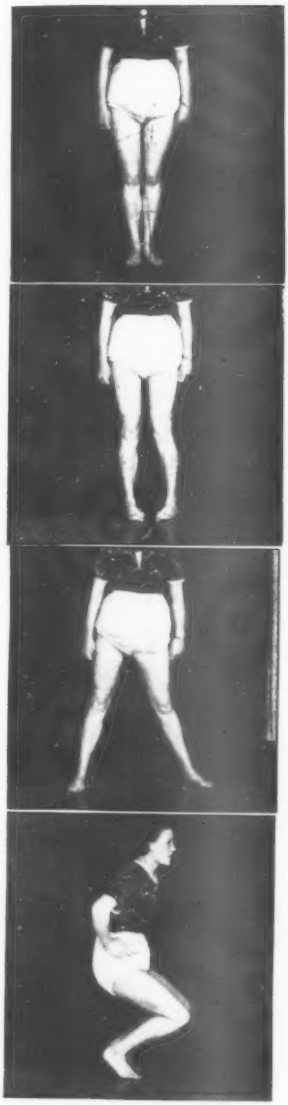
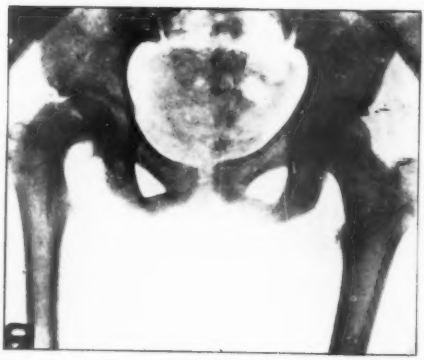


Present function.



1927.

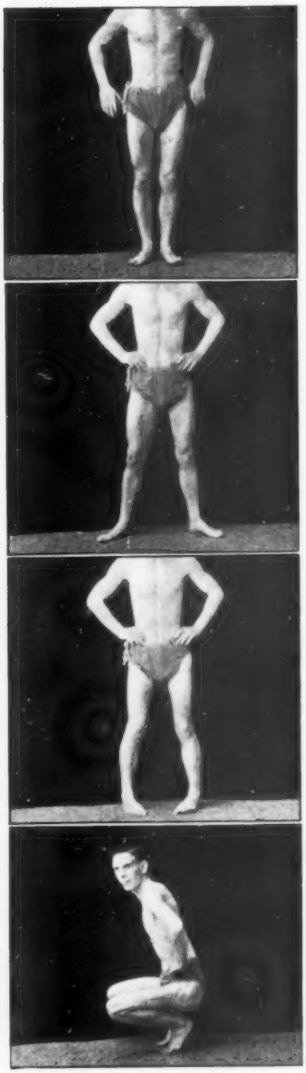
1927. Reposition.

1938.

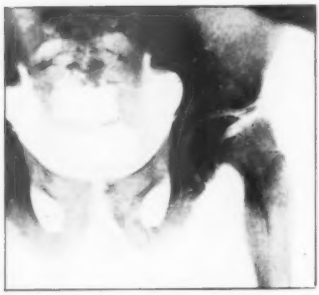
Case record No. 12.

ROBERT OLLERENSHAW : The Femoral Neck in Childhood.

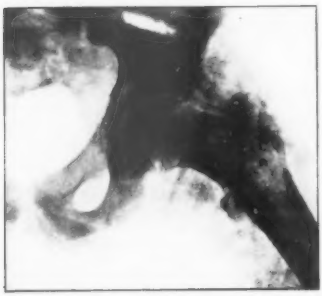
PLATE XVI.



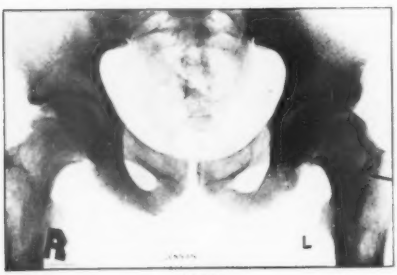
Present function.



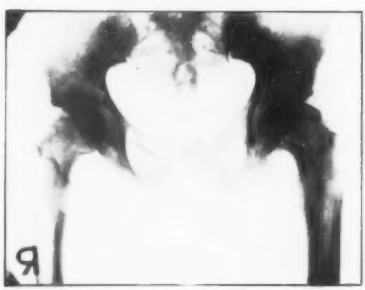
1931.



1931.



1933.



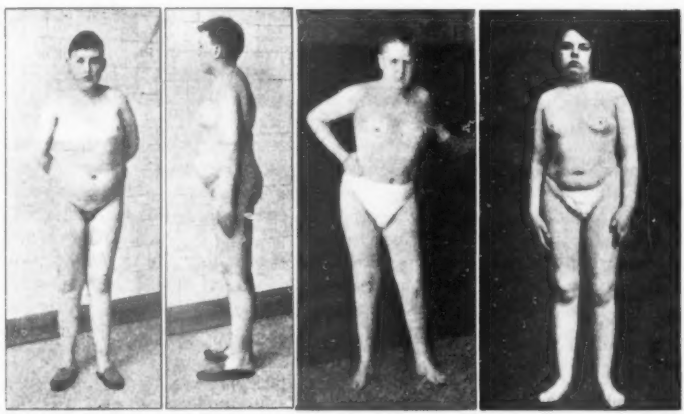
1938.

Case record No. 13.

ROBERT OLLERENSHAW : The Femoral Neck in Childhood.

Ætiology.—Apart from the fact that such a large proportion of the cases are either definitely of Fröhlich's type or, at least, considerably overweight, we have little to help us in determining the underlying cause of separation. The very large proportion of cases exhibiting definite endocrine disturbance, however, points quite clearly to the underlying cause. Rickets and "renal rickets" have been cited. In no case have I seen rickety appearances, and in none have I found albuminuria. Many bilateral slippings are on record. Hofmeister reported that in one-third of his cases the slipping was bilateral. Only one of my patients, a boy aged 14, of huge size, had a bilateral slip. He had complained for three months of occasional aching in the left hip, and he had limped at times. One day he had a sudden pain in the hip, and presented all the usual symptoms, which are exactly like those of a fractured femoral neck.

The displacement was reduced under an anæsthetic, and the limb was fixed in plaster. After three months the patient was up with the limb in a caliper. Two weeks later he had a pain in the right hip, and was brought back to hospital where it was found that the right epiphysis had slipped (Plate X, fig. 11). Gütig [8] reports



A B C D

FIG. 10.

a case in which the second hip presented a slipped epiphysis whilst the first was still immobilized in plaster, and the patient confined to bed. In view of the numerous observations now on record I think we cannot doubt that this condition is always due to disease.

If we agree that slipped epiphysis is not due to trauma, it is important that we should make this clear at every available opportunity. I heard last week of two cases, in the Midlands, in which girls aged 15 and 16, respectively, both in domestic service, had been awarded damages under the Workmen's Compensation Act, on account of slipped epiphyses which were undoubtedly due to disease, there having been prodromal symptoms and a minimal amount of possible trauma in each case.

Treatment.—If these children can be caught in the pre-slipping stage (and in nearly all of them there is a period varying from one to nine months in which complaints of occasional aching, or limping, have been observed) the hip should be immediately fixed in plaster, and all weight-bearing should be prevented for three months; followed by caliper for six months. The opposite hip must be carefully examined, and regarded with suspicion. Brailsford has pointed out a denser line on the detached edge of the epiphysis, and a clearer rarefied line on the diaphyseal side. After slipping

has occurred certain rarefactive changes can always be seen, but in *no case* have I observed definite pre-slipping changes which could be demonstrated radiographically. I have followed two lines of treatment. For those cases in which the slipping had recently occurred, replacement under anæsthesia, and fixation in plaster was adopted. Other cases were of some weeks' standing, and manipulative replacement could not be effected. In these a subtrochanteric osteotomy was performed and the limb was abducted sufficiently to reproduce the normal angle of the neck ; in these cases the same period of prevention of weight-bearing is prescribed as in the first group.

In a recent paper to which I have already referred, P. D. Wilson, of New York, reported an interesting series of nine cases in which he had used a Smith-Petersen nail with excellent results. He reported that seven out of the nine cases were either definite " Fröhlich's " or of an obese type. His observation as to the amount of growth which takes place at the upper end of the femur after the age of 14 years closely agrees with my own view, and this factor, therefore, offers no contra-indication to the use of a Smith-Petersen nail or any device which might prevent growth. The simplified after-treatment which this method allows is attractive. The large number of cases in which slipping has occurred in the opposite femur, after union of the first, must not be forgotten during after-treatment.

Although Wilson's cases provide a strong argument for open operation, I believe that we can procure results equally good by more conservative methods. Three years ago McAusland [9] reported 45 cases in which he had used closed manipulative reduction. In 36 of these there was perfect function. Judging by my own and other cases, I believe that this proportion of first-class results is usually attainable.

I am showing radiograms [1] from six representative cases ; four of these were treated by manipulative reduction and plaster, as described, and in two, which were of longer standing, and in which the epiphyses remained displaced after attempted manipulation, osteotomy was performed.

In one case of the first group the radiogram shows changes in the contour of the head of the femur which look ominous, but function is good and the patient does not complain of any pain, though she is engaged in very active work. Whether more troublesome changes may occur later I cannot say ; it is ten years since she was treated.

The cases in which osteotomy was performed are undoubtedly functionally satisfactory, but of course there is a little shortening, and I should not agree with those who say, or have said, that manipulative reduction should not be carried out, and that a routine osteotomy should be performed later. (Case records 8 to 13, Plates XI to XVI).

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9 McAusland, A. R. " Separation of the capital femoral epiphysis ", *J. Bone & Joint Surg.*, 1935, **17**, 353.

[1] The radiograms were supplemented by cinematographic records.

Section of Otology

President—E. D. D. Davis, F.R.C.S.

[*November* 4, 1938]

DISCUSSION ON RADIOGRAPHY OF THE PETROUS BONE

OPENING PAPERS

I (A).—Stereoradiography and Radiographic Analysis

By Dr. C. Chaussé (Paris)

Radiography of the petrous bone presents many difficulties. As Thienpont has said, it is extremely difficult to secure at two different times Stenvers' incidence in exactly the same position.

In order to overcome these difficulties, we have: (1) Designed an apparatus—the "stereoradiographic centering" apparatus; (2) adopted a method of centering in two stages—the "anatomo-geometric" method; (3) endeavoured to improve the quality of radiograms by a precise localization process—"anti-diffusion analysis"; (4) systemically used "partial incidences"; and (5) made use of stereoradiography.

By combining these different factors we arrived at a method of radiographic analysis to which we gave the name of anti-diffusion stereoradiographic analysis.

Briefly, this is a method of radiographic exploration by which analytic principles can be easily applied to the domain of radiology. Its purpose is to decompose the radiographic exploration of an organ or anatomical region into a series of fragmented secondary examinations, each one of the smallest parts of the organ being considered as an entity.

The apparatus which enabled us to carry out with ease this apparently very complicated procedure may be briefly described as follows:—

It consists of a table provided with a mechanical device connecting the X-ray tube with the examination table. The connexions are established in such a way that the X-ray tube may be moved in a line parallel with the table or along an imaginary spherical surface the centre of which corresponds with the centre of the film, at the point of junction of the diagonals. The casette support may, in its turn, be displaced within the plane of the table, and it carries along with it the central ray which always passes through the centre of the film. From the casette-holder

a beam of light is directed towards the focus of the X-ray tube. This light-beam impinging on the part resting on the casette, indicates, by a luminous spot, the point of exit of the central ray. Finally, on one side of the casette is to be found a combination guiding-table and negatoscope, under which is a movable target-finder. The knobs controlling the movements of this finder act, at the same time, upon the casette-holder and on the central ray.

Two-stage focusing, or anatomo-geometric method.—In the first stage of this method the usual anatomical landmarks are utilized and a radiogram of 8 cm. or more is taken. By the use of concentrated developing and fixing solutions, this is obtained in three minutes.

In the second stage the patient's head being immobilized adequately, the operator proceeds with a graphic centering on the first radiogram which is laid, while still wet, on the guiding-table-negatoscope. This centering is made on the part of which he desires a smaller and clearer radiogram; that is to say the centre of the target-finder is brought exactly under that part and a smaller diaphragm—one of 3 cm., for example—is put on the localizer. Thus a second radiogram, 3 cm. in diameter, is obtainable.

It may thus be seen that it is possible to fraction the radiographic exploration of an organ into a series of successive examinations. We have noted that the clearness of an image is considerably increased when the diameter is reduced to 5 or 6 cm.: this has also been noted by Lysholm. It is because of the almost total elimination of the diffused rays that this remarkable sharpness is obtained.

The improvement of the image is still further increased by a feature of the centering apparatus. Even with a 5 cm. field it may happen that there is some diffusion in certain parts of the radiogram. It is the case, for instance, with Stenvers' incidence for the temporal bone. There appears around the mastoid a zone of diffusion (halo) caused by an area of over-exposure. It is easy to get rid of this halo by bringing into play the concentric circles of the target-finder, which enable us to exclude from the final radiogram the black areas of over-exposure.

Then again, the region to be examined often presents zones of varied opacity: the time of exposure for the whole temporal bone is suitable neither for the mastoid nor for the labyrinth. Here also it becomes easy, with the aid of the first radiogram, to divide the radiographic examination into a series of secondary examinations, taking into account the difference in opacity of the different parts.

To this combined method, the purpose of which is to improve the quality of the images, we have given the name of "analytic antidiffusion" in opposition to the total antidiffusion obtained with certain diaphragms, such as the Potter-Bucky.

Partial incidences.—In the antidiffusion radiographic analysis there is also, besides the question of fineness, that of incidence. As might have been foreseen, experience has shown us that, in order to be best brought out, each part of the temporal bone requires its own incidence. To the radiograms obtained when practising the fragmentation mentioned above and varying the angle according to the region to be examined, we have given the name of "partial incidences".

These play a very important part in the analysis of the petrous portion, especially in cases of fractures.

Stereoradiography.—Separating the different planes in depth, as it does, stereoradiography brings to the analytic method a new element. Compared with ordinary radiography, it offers certain advantages, such as its amplifying role in visual perception.

Its simplicity is undeniable: one needs only to see the centering apparatus in operation to realize this. Its advantages are, however, still questioned by some workers. It seems to us that this difference of opinion is mainly based on the quality of the radiograms used.

In order that radiography should be entirely satisfactory, the images should be extremely rich in detail; they must present a wide gradation of tints—especially a

wide range of greys ; they must not, of course, show any black portions. With such radiograms the observer is enabled to view, orthoscopically or pseudoscopically, the continuity of the upper and lower surfaces, which cannot otherwise be dissociated.

This technique greatly increases the possibilities of radiographic examination of the cranium, most of the orifices, cavities, and eminences of which may be studied separately. The precision of the anatomo-geometric method enables one to bring the image of an orifice, for instance, to be projected on the image of a plane surface of equal thickness, resulting, on the film, in a homogeneous radiogram. Stereoradiography then comes into play, enabling differentiation of the two images to be made.

A whole series of new incidences may thus be realized which cannot be obtained when one is focusing with the aid of guiding-marks taken on the surface of the skull.

The precision of this method has enabled us to explore stereoradiographically the jugular foramen and its margins. It has also enabled us to make a detailed study of Stenvers' position, already made by Graham Hodgson a few years ago.

Let us suppose that we have realized this incidence while placing the cylindrical localizer vertically. We note that the X-ray tube may be shifted two ways—towards the mastoid or towards the petrous apex. The study of the images corresponding to these two displacements has shown us that the projections of the superior semicircular canal and of the auditory meatus follow two rules :—

Rule I.—The shape of the image of the superior semicircular canal varies progressively as the X-ray tube is moved from the mastoid towards the apex ; at first broadly ovoid, it assumes the shape of a more and more elongated oval, then becomes linear, and finally becomes a triangle the apex of which is upwards, the sides becoming most widely separated as the tube reaches the end of its course towards the apex.

Rule II.—The radiological aspect of the internal auditory meatus is closely allied with that of the vertical superior canal ; when the latter assumes an oval shape the auditory meatus presents itself transversely, is seen indistinctly, without free borders, and the internal orifice of the fallopian canal is projected on the bottom of the internal auditory meatus. When the superior canal appears as a triangle, the auditory meatus is seen obliquely, its free border is very distinct, and the internal opening of the fallopian canal is projected near the free border of the meatus.

These two rules show that, in order to be distinctly brought into evidence, each one of these parts of the petrous pyramid requires its own incidence. Moreover, they lead us to the definition of a basic incidence. We will call PIo this standard incidence, in which the superior semicircular canal is seen in profile and in which the horizontal canal is likewise seen in profile. Starting from this incidence, we are enabled to represent with precision each particular incidence by means of a formula.

If S be the source of X-rays, P the petrous apex, M the mastoid, we note that : PIo + S → M − 6 means that, after having started from position PIo, we have shifted the X-ray rube 6° towards the mastoid for the second radiogram.

We were thus led to the adoption of three partial incidences derived from Stenvers' incidence :—

(1) The superior semicircular canal incidence :—

$$\text{PIo} + \text{S}'_{\text{s}} \rightarrow {}'_{\text{i}}\text{M} - 6 - 12$$

(2) The cochlear incidence, represented by PIo itself, inasmuch as the axis of the cochlea coincides with the central ray.

(3) The internal auditory meatus incidence.

$$\text{PIo}^{-} + \text{S} \rightarrow \text{P}\ 12 - 18$$

These find an application in the radio-diagnosis of fractures of the labyrinth. In

fact, as was shown at the Antwerp Congress, these linear fractures are visible within an angle of exploration included between PIo and PIo + S → M −12.

Antidiffusion stereoradiographic analysis has given us satisfactory results in practice—especially in cases of mastoiditis, labyrinthitis, petrositis, fistulas of the canals, foreign bodies, &c. But the results were not so precise when exploring cavities of the middle ear and for the diagnosis of lesions of the walls of these cavities. So that in order to get rid of the superpositions which mar the images of the tympanic cavity proper, the aditus, and the antrum, we were led to use tomography.

Tomography.—Instead of using a continuous movement of the X-ray tube and film, we resorted to a "fractional displacement", that is to say that during the various exposures tube and film were immobilized. (Mathematically, of course, a continuous movement is the result of an infinite series of elementary movements.) We thought that the final image would thus probably gain in neatness, and that additional data might be obtained. Indeed when a continuous linear movement is used the image of a point not situated in the plane of section shows on the film as a line and it is difficult to say whether, in reality, we are dealing with a moving spot or with a line, whereas with the fractional displacement the linear image shows as being formed by a series of fine dots and it is thus possible to see that it is the projection of one point alone. *Therefore, by this method, the parts situated outside the sectional plane are recognizable, and this adds a complement of information to the tomogram.* These images being of very slight intensity, do not interfere with the reading of the sectional plane: moreover, it is easy to further attenuate them by increasing the number of exposures.

While trying to ascertain the number of exposures necessary for obtaining a clearly readable tomogram, I was astonished to find that very few were sufficient—for instance five or six for a spongy temporal bone. For my research on the temporal bone I was therefore led to use my centering apparatus as a tomograph, and the work proved to be extremely easy.

This method of discontinuous tomography, which might also be called "tomography by successive exposures", does away with the vibrations produced by the sharp motions of the mechanical parts of the apparatus used in ordinary tomography.

Without entering into technical details of radiography, I may say here that the objections formerly raised to tomography on the grounds of the trouble and expense involved, are no longer valid, since with our technique, it takes only about ten minutes to obtain three 9-by-12 cm. films, a stereoradiographic couple and a tomogram of a section automatically passing through a selected part. We endeavoured, therefore, to combine antidiffusion stereoradiographic analysis with tomography.

Antidiffusion analysis applies especially to surfaces; tomographical analysis to depth: by combining both we are led to the analysis in three dimensions, and this is easily accomplished with the modified stereoradiographic centering apparatus.

To sum up: This method enables us to cut out radiographically within the cranium any pre-selected bony structure of very small volume and to make an antidiffusion-stereoradiographic analysis of it. Of course it is impossible to make the 3-dimensional analysis without preliminary accurate localization so that the latter is necessarily part of the method. This 3-dimensional analysis may be successfully applied to the special incidences used in otology, but they do not all equally benefit by it. For instance, in our experiments on the dry skull, whereas in a tomogram of the petrous portion in Stenvers' position, the different parts of the labyrinth are still recognizable, they do not show as clearly as on one of our stereoradiograms. On the other hand, the antrum and, especially, the tympanic cavity proper, are particularly suited for 3-dimensional analysis. On tomograms made in Schüller's

PLATE I.

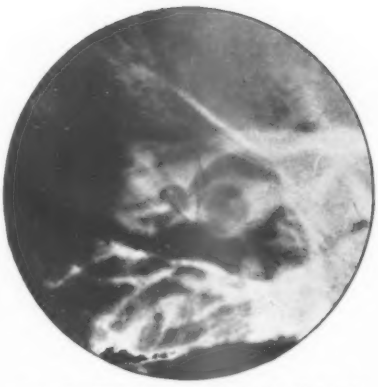


FIG. 1.—Fracture of labyrinth through cochlea. (Prof. Lemaitre's case.)

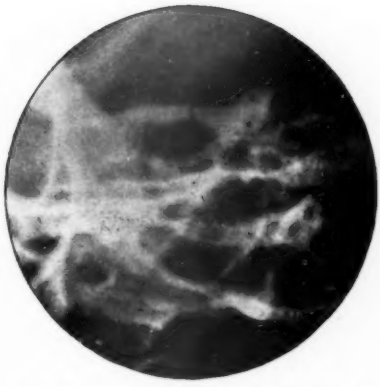


FIG. 2.—Fracture of labyrinth through cochlea.

FIG. 3.—Purulent petrositis. Destruction of greater part of pars petrosa, causing fistula of superior semicircular canal. (Dr. Ramadier's case.)

FIG. 4.—Purulent labyrinthitis, with osteitis of the three semicircular canals.

Dr. C. CHAUSSÉ: I (a).—Stereoradiography and Radiographic Analysis.

PLATE II.

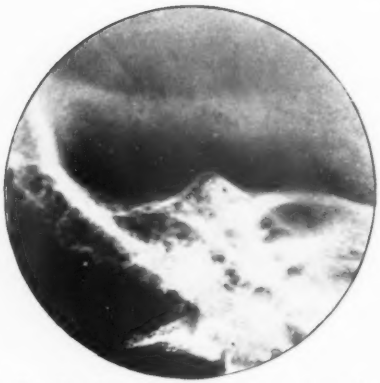


FIG. 5.—Tumour of acoustic nerve, causing enlargement of internal auditory meatus.

FIG. 6.—Tumour of acoustic nerve, causing destruction of posterior wall of petrous bone (Prof. Clovis Vincent's case).

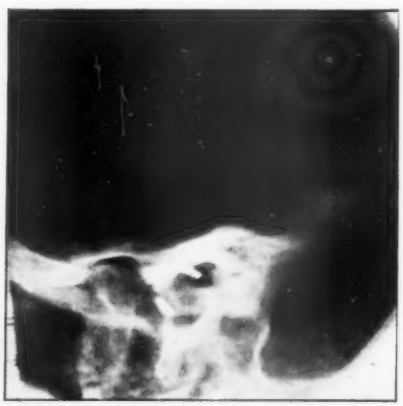


FIG. 7. — Stereo-stratigram I (dry skull), Schüller's incidence. The section plane passes through the horizontal semicircular canal. N.B.—This canal is seen distinctly while the metallic hooks fixed on the surface of the skull are hardly visible though recognizable (upper part of image). Note also the difference of clearness between the two metallic guide-marks, the clearer being the one placed in the aditus, the other being in the tympanic cavity proper.

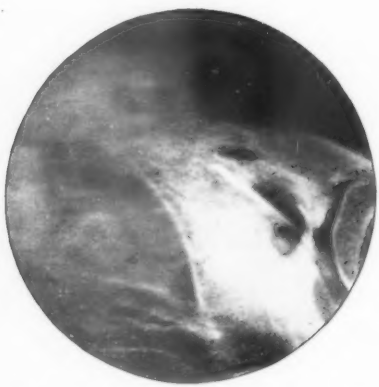


FIG. 8. — Stereo-stratigram (dry skull), Mayer's incidence. A probe has been introduced through the auditory canal into the antrum. Note that the clearest image of this probe is its end, the section plane passing through the aditus and antrum.

incidence and passing through different levels, the images obtained show various aspects.

Stereostratigraphy.—The interpretation of images with which we are not familiar is often difficult. That is why, remembering how stereoradiography had helped us in the interpretation of mastoid images, we tried to utilize it to obtain "relief" in stratigraphy.

Stratigram IV (Plate II, fig. 8) shows the bottom of the tympanic cavity proper with its promontory and the fenestra ovalis partly surrounded by the elbow of the facial canal.

In order to get the effect of relief clearly, the sections must be of a certain thickness; then, the two stratigraphic images must be subjected to an angular displacement equal to the stereoscopic angle. In our opinion, stereo-stratigrams are easier of interpretation than simple stratigrams.

By combining the height of the section level with variations of Schüller's incidence, we obtain planigrams more specially suited for the study of a given organ or part. For example, on Stratigram I (Plate II, fig. 7) we were enabled to study particularly the horizontal semicircular canal.

Tomography seems to be of as great advantage with Mayer's incidence as with Schüller's. In both cases the exploration of the tympanic cavity proper and the antrum is made possible, and lesions of the walls of these cavities may be correctly diagnosed. The 3-dimensional analysis applied to Mayer's incidence shows, better than the ordinary Mayer, the sides of these cavities which are, in this way, freed from cells superposition.

By properly selecting the plane of section, stereostratigraphy may perhaps allow us to investigate the deep wall of the antrum that we just see through an opening into the external wall (radiographic opening made by the section plane).

These tomograms are not quite so clear on the living as on the dry skull as the trabecular structure of the diploetic tissue disappears. This may be owing to the intensifying screens used, the sharpness of the lines being more or less marred through lack of sufficient fineness of their grain. We must look to the film manufacturers to help us in that direction.

I (B).—Combined Method for the Localization and Extraction of Radio-opaque Objects by Means of the "Light Compasses"

By Dr. C. CHAUSSÉ (Paris)

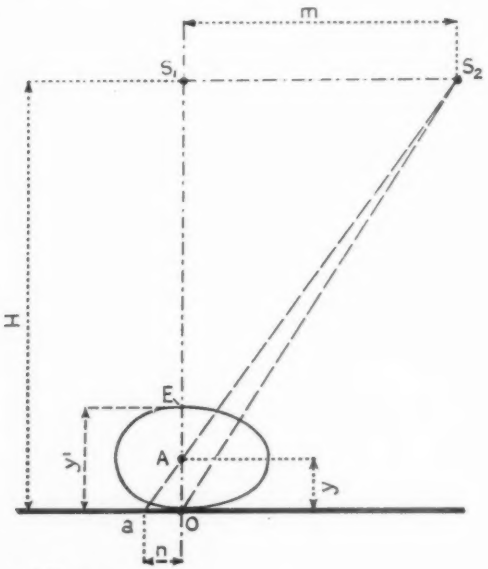
THIS method is based upon the possibilities offered by my radio-stereoradiographic-centering apparatus which, for this particular purpose, has been improved by the addition of two new light sources. One of these is attached to the lower end of the cylindrical localizer, giving the direction and path of the central ray and moving along with it; the other is attached to the upper arm of the frame, may be turned in any direction, and acts as a true theodolite.

To the apparatus thus equipped I have given the name of "light compasses".

The following study has been made independently, without reference to anything more or less similar which might have been done or published previously.

The position of a foreign body imbedded in the midst of a homogeneous mass, where it is impossible to situate it by its relations with fixed anatomical landmarks, may be determined in several ways. I adopt that which seems to be most helpful to the surgeon, to whom I propose indicating—from the time he makes his first incision and throughout the operation—the direction in which the foreign body lies, as well as its depth; this being accomplished without any appreciable complication of the surgical technique.

[3] This geometrical problem is very simple and its explanation may be found in any textbook. It applies to the "light compasses" as indicated in the accompanying figure :—



S_1 is the source of X-rays ;

S_2 is the position occupied by this source after displacing it in a parallel with the table ;

m is the distance between S_1 and S_2.

O represents the centre of rotation of the compasses.

A is the projectile or foreign body.

We see that in position S_1 the central ray passes through A along the line $S_1 - O$. The projected images of the foreign body shall be at O and a.

Calling "n" the length of displacement of the image, the distance y between the foreign body and the film may be calculated according to the formula :—

$$y = \frac{H\,m}{m + n}$$

H being the distance between anticathode and film.

This procedure would suffice to determine the position of foreign body A which is on the vertical line passing through point O, marked on the skin by the beam of light indicating the point of exit of the central ray.

But to proceed with the extraction it would be necessary to turn the patient by 90° in order that point O should be on the upper surface of the part to be operated on ; for obvious reasons this procedure is impracticable.

Therefore it is preferable to calculate the distance E A, which is the difference between O A and O E (E being the point of entrance of the central ray).

This can be done by placing at E, on the surface of the skin, a radio-opaque guide-mark, the height of which above the film y' may be calculated as it was for y :—

$$y' = \frac{H\,n'}{m' + n'}$$

If such localization is made in two successive steps, the distance found according

to the difference between y and y′ may be more or less approximate, this being due to possible mechanical imperfections and to possible errors in the reading of distances m − n, m′ − n′.

If, instead of proceeding with the two localizations in successive steps, we operate simultaneously, that is by taking the images of A and E on the same film, we note that the mechanical error is the same for both and is thereby nullified when we calculate the difference y − y′; the same is true for the possible error in reading distances m and m′. Thus distance E – O is obtained with greater precision, and it is possible to tell the surgeon that the foreign object is at a distance of *x* millimetres on the vertical line passing through indicator E and below that point.

These indications, however, are not enough for the surgeon, for it is difficult, in practice, to follow exactly the vertical line.

Moreover certain causes of error occur between the time of localization and the operation. For instance, in the case of a projectile embedded in the thigh muscles, the fact of transporting the patient from the X-ray room and table to the operating room and table may bring about some change in the position of the projectile; sliding the patient from one table to another may cause a displacement of the skin by comparison with the foreign body; pressure exerted by the assistant's hand on the patient also affects the position of the soft parts.

For these reasons we have endeavoured to combine localization and extraction by making use of the centering apparatus table as an operating table.

Technique.—The localization is done in the theatre immediately before the operation, the patient being under the anæsthetic and placed in the required position.

The cylindrical localizer is brought vertically above the position of the foreign body, above the place at which the incision is to be made—this being decided by the previous approximate localization which is part of routine practice.

A hollow diaphragm, the aperture of which is provided with a horizontal cross made of fine wire, is inserted at the lower end of the localizer. A first radiogram is made; it is developed and fixed within three minutes and placed, while still wet, on the glass plate of the negatoscope. On this radiogram the image of the cross generally comes within a certain distance from that of the foreign body.

By manœuvring the control knobs, the centre of the target-finder is brought to coincide with the centre of the image of the foreign body; at that moment, the C R passes through the foreign body.

Then the cross-diaphragm is removed and replaced by the central luminous source, the beam of which indicates on the skin the point of entrance of the C R. A radio-opaque guide-mark is placed on that spot.

The luminous source is then removed and replaced by the cross-diaphragm: another radiogram is made, the X-ray tube being then in position S_1; the tube is now shifted to position S_2 and a second exposure is made on the same film, the casette, of course, having remained on its holder. Two images of the same point are thus obtained. Distances n + n′ are measured on this radiogram; by referring to a table of ready-made calculations computed once for all, distances y and y′ are read, and the difference gives within a millimetre or two the distance of the foreign body from the skin.

In order to adjust the light-compasses, the central luminous source is placed again at the lower end of the cylindrical localizer; the beam of light emanating therefrom indicates on the skin the point of entrance of the central ray which passes through the foreign body; in fact it follows the same path as the central ray. Then the theodolite is rotated in such a way that its beam of light is brought to impinge upon the skin at the same spot as that which is struck by the beam emanating from the central luminous source.

The next step is to slide the theodolite vertically downwards for a distance equal to that of the foreign body from the skin. The result of the latter displacement is to bring both light beams to meet on the foreign body. During the course of the

operation the surgeon will see at the bottom of his dissection two luminous spots which will come nearer to each other as he gradually gets deeper; when these two spots finally come together, the operator will have reached the body to be removed.

When the size of the incision is not large enough to admit both luminous rays together, a slightly different technique may be used.

The two light spots are made to coincide on the surface of the skin and the depth of the dissection is gauged by an instrument made up of a small straight graduated rod bearing a small horizontal disc at its upper end. Let us suppose that the length of the rod is equal to the distance between the foreign body and the skin: When introducing this instrument into the site of operation so that its lower end rests on the light spot issuing from the central luminous source, the two light beams will produce two separate spots on the disc as long as the lower end is at some distance from the foreign body. On the other hand, when the lower end of the instrument comes in contact with that body, both spots coincide.

Thus the surgeon has a precise means of ascertaining the distance at which the body is located.

It may be objected to this method that it presupposes the absolute immobility of the organ to be operated upon, a condition difficult to obtain, notwithstanding all precautions. We must note, however, that at any given moment the surgeon is enabled to appreciate any change of position by two indications:—

(1) The light spot coming from the beam emanating from the bottom of the casette holder and formed on the surface of that part of the body resting on it, and (2) the upper light spot emanating from the central luminous source and formed at the bottom of the zone of dissection, the fixedness of which the surgeon may control by means of an artery-clamp allowed to remain in position.

The surgeon may thus, at any time, bring the part operated on into the proper position by causing the coincidence of both light spots emanating from the light compasses and of the corresponding guide-marks.

The dimensions of the light-compasses are such that the surgeon can operate at ease, without being impeded by the X-ray tube, &c., which are placed well above his head.

During the course of this study we have reached anew certain principles already known, e.g. (1) the use of one film for two images (Béclère and Morin); (2) the radio-opaque guiding-mark applied on the skin (Cottenot and Boudaghian); (3) the principle of Hirtz's compasses. However, instead of taking the fixed points of the compasses on the patient we ascertain them in space, by a system consisting of the source of the X-rays and of the centering table.

The original feature in my method consists in the use of the light beams guiding the surgeon without any interference with his work, and in combining the operations of localization and extraction.

II.—Radiology of the Mastoid Process

By H. Graham Hodgson, C.V.O., F.R.C.P.

Radiographic Technique and General Considerations

A brief consideration of the anatomical variations and the pathology of the mastoid process indicates the scope of the information which is required of the radiologist by his surgical colleague.

The required information may be summarized under two main headings, as follows:—

(1) *Anatomical information.*—(*a*) Are the processes cellular or acellular? (*b*) If cellular, what is the distribution of the cells? Do they extend beyond the

recognized normal limits? Is the cortex thick or thin? (*c*) If the processes are acellular, are they diploetic or sclerotic? This latter type is a developmental and not a pathological type, as one might infer from its name. (*d*) Are the processes symmetrical? Developmental asymmetry is rare, but asymmetry may be the result of disease in early life interfering with the extension of the antral mucosa into the surrounding bone and thereby preventing pneumatization of the process. Such a mastoid process may be recognized by the fact that besides being poorly pneumatized, it will be smaller than its fellow of the opposite side.

(2) *Pathological information.*—At first sight this subdivision would appear to be of much greater importance than the first, but as I hope to show, this is far from being the case. The type of mastoid and the distribution of the cells are of paramount importance to the surgeon, not only from the operative point of view, but from that from which he evaluates the patient's symptoms. The radiologist who wishes to give a useful opinion on the X-ray findings cannot pay too much attention to the influence of anatomical type on the pathology and possible complications of mastoiditis. The only method short of operation by which the surgeon can tell whether a mastoid is pneumatized or not is by X-rays, and the difficulties of diagnosis, both clinical and radiological, are very much increased in a diploetic or sclerotic mastoid.

The actual technique which I use is as follows:—

I take five radiograms which give three separate and distinct views of the mastoid processes, each of them necessary. I make use of the sinus stand which I designed ten years ago for sinus radiography, and as in sinus radiography, the angles used must be exact and not "somewhere near" or "about".

(1) The first is the postero-anterior oblique position. The head is grasped in the clamp and rotated through 45° which brings the petrous bone parallel to the film and throws the mastoid process clear of overlapping shadows. The tube is centred over the process. In this view one sees whether the process is cellular or not, the thickness of the cortex and the extent to which the cells spread inwards into the petrous bone.

(2) This is the lateral oblique position. The head is in the lateral plane, and the tube is tilted downwards 30° and centred on the external meatus nearest the film. This view gives a 90° variation of the perspective angle from the previous one and it shows the distribution of the cells in the antero-posterior plane. It demonstrates the relationship of the cells to the knee of the lateral sinus, whether they extend upwards into the squamous or forwards into the zygoma. It shows the thickness of the tegmen and whether any tegmen cells are present.

(3) This is the 30° fronto-occipital view, and it is sometimes very useful. It not only shows both petrous bones with any cell extension into them, but it gives one what amounts to an axial or end-on view of the two mastoid processes, on the same film. The utility of this is that in the early stages of infection the very slight hazy lack of translucency of the cells showing in the other views, is very much increased in this one owing to the fact that one is looking through the whole length of the cells, which is much greater than a transverse section.

General considerations.—We need to draw a very hard and fast line between the cellular and acellular mastoid when we are considering the scope and accuracy of X-ray diagnosis in this subject, and you will forgive me if I endeavour to illustrate my meaning by a nautical simile. I will liken the radiograph of a cellular mastoid to a clear night at sea, when the look-out man in a ship's bows, providing he knows his job, can give accurate and reliable information to the bridge. He sees and immediately recognizes the coastwise lights and the lights of other shipping. His knowledge teaches him to distinguish between the masthead lights of vessels under power, the two white lights and tricoloured lantern of the trawler, and the port and starboard lights of a sailing vessel. From the position of these lights, although he

cannot see the vessels themselves, he can tell at a glance if their course clears his ship in safety or whether they are stem on. Such, in analogy, is a cellular mastoid.

A diploetic mastoid, however, is to the radiologist like a heavy mist with 300 yards' visibility, and a sclerotic mastoid like a thick fog through which the navigating officer can scarcely see the stem-head. Under such conditions, once the look-out has reported the lack of visibility, the wise captain steers his ship solely by dead reckoning, depth soundings, and estimated bearings on the fog-horns of lightships and the syrens of other vessels. In other words he relies on his basic training and knowledge alone, and he ignores the look-out, for he knows that if the look-out sees anything over the bows but fog, his ship is in grave danger. You will, however, appreciate the one important difference in this simile, for whereas in thick weather at sea, vessels proceed at reduced speed, the surgeon, when informed by the radiologist that he is dealing with an acellular mastoid, goes full steam ahead. He does not wait for any further information from the radiologist, and realizing the much greater danger of grave complications, operates at an earlier stage and on fewer signs and symptoms than he would in the case of a cellular mastoid. The occurrence of an acute mastoiditis as a sequel to otitis media depends to a large extent on the anatomical type of mastoid present. The complicated and communicating network of cavities in a cellular mastoid is more prone to the spread of infection and very much more difficult to drain through a paracentesis opening. Therefore an acute mastoiditis is much more likely to occur in such a mastoid than in one of the diploetic or sclerotic type. On the other hand, the cortex is thinner and the signs of acute inflammation appear earlier both clinically and radiographically in a cellular mastoid.

In an acellular mastoid, however, the mastoid antrum has a thick layer of bone between it and the surface, and only a very thin layer of bone, the tegmen antri, separates it from the meninges. Because of this, dangerous complications are very much more likely to occur, owing to the infection taking the path of least resistance. In the early stages of such a case, when the clinical signs are doubtful, the report of the radiologist that the mastoid is acellular will immediately reveal to the surgeon the reason for the doubtful signs and is all he wants to know. In such a case, where owing to the density of the overlying bone the mastoid antrum may not be visible, the radiologist, when asked about evidence of infection, should point to the bony " fog " and say " I do not know ", and he might add with emphasis, " I do not want to know ", because generally the first sign of infection he will see in such a process is bone destruction, and by that time the patient's life will be in imminent danger.

Interpretation

(*a*) *Acute mastoiditis in a cellular mastoid process.*—With good radiographs, in the great majority of cases of acute otitis media some lack of definition of the mastoid antrum can be discerned, owing to œdema of the mucosa. If the condition progresses and the infection of the mastoid process spreads, the peri-antral cells, and later the other cells of the process, become hazy in outline and more opaque than their fellows of the opposite side, and finally the cell walls become invisible. In cases of bilateral infection or developmental asymmetry, the radiologist relies on the lack of definition of the cell outlines and his experience of the normal transradiancy of the mastoid cells.

The distribution of the mastoid cells and, especially, the relationship of any cells to the lateral sinus, the tegmen antri, or the zygomatic process, should be carefully noted.

Attention should be drawn to any cells medial to the labyrinth or extending upwards into the squamous portion of the temporal bone. These cells, if infected, have to be carefully searched for. Infected squamous cells often show little difference in radiographic density, only a slight localized blurring of the bone structure being

discernible. It is obviously of the greatest importance that the surgeon should know of the presence of such cells. The use of a powerful magnifying glass, together with comparison with the cell distribution on the opposite side, will usually reveal their presence. Infected cells bordering on and posterior to the lateral sinus should be noted, and in this connexion stereoscopic views will often be found useful.

(*b*) *Chronic mastoiditis in a cellular mastoid.*—Chronic suppurative otitis media, with a constant or intermittent discharge from the middle ear is a common disease, usually commencing in childhood. The name is misleading as it tends to focus attention on the middle ear, with a consequent tendency to local treatment, whereas the real site of the infection frequently lies at a distance from the middle ear. A persistent infection anywhere from the nasopharynx to the mastoid air cells may be responsible for a " middle-ear " discharge. Where the condition is the result of a chronic mastoid infection a radiograph of the affected process will show it to be opaque. The cell walls will be seen to be very blurred and indistinct, or will have disappeared altogether. In such cases the phrase " breaking down of the cell walls " is frequently used somewhat loosely and inaccurately. On the one hand the cell walls may actually be eroded, but on the other long-continued infection and consequent hyperæmia will cause decalcification and therefore non-opacity of the cell walls, and we have no radiological means of distinguishing between the two conditions. It is better, therefore, to describe this appearance by saying that " the cell outlines are invisible ".

(*c*) *Mastoiditis in an acellular mastoid.*—In this the difficulties of diagnosis are greatly increased, from both the clinical and radiological points of view. In a diploetic mastoid process some cloudiness of the mastoid antrum may be seen and there may also be present a few peri-antral cells which show changes. In a sclerotic mastoid, however, the mastoid antrum will probably be concealed by the dense overlying bone.

Speaking generally, in a case of acute mastoiditis in an acellular process, the radiologist has served his purpose when he has informed the surgeon that the mastoid is acellular. At the same time he should be careful to make quite clear the fact that the absence of radiographic evidence of infection of the process, by no means indicates that disease is not present. In a sclerotic mastoid, and frequently in a diploetic mastoid, no X-ray signs whatever are present until actual bone destruction commences, and by the time this has begun very serious complications may have arisen.

In such cases the clinical signs are often slight, but as pointed out previously, the risk of serious complications is much greater than in a cellular mastoid. The radiologist's report that the process is acellular will, however, give the surgeon the necessary clue to the paucity of clinical signs, and he will operate on considerably less evidence than he would in the case of a cellular mastoid. Early operation is essential in such cases, as the mortality of all intracranial complications of acute mastoiditis is high.

The important radiological point in such a case, therefore, is that the mastoid process is acellular, and the absence of X-ray evidence of disease should be ignored if it in any way conflicts with the clinical suspicions.

Complications of Mastoiditis

Cholesteatoma.—This is a chronic condition in which the middle ear and the mastoid antrum and process contain packed masses of flaky epithelial debris which may grow to a large size. They are often accompanied by great destruction of bone; the dura mater may be exposed—with the formation of an extradural abscess—or the inner tympanic wall may be eroded—with exposure of the membranous labyrinth. The X-ray appearances are those of a smooth-walled relatively transradiant cavity in the mastoid process, usually with a sharply defined margin.

Intracranial complications.—There is no direct X-ray evidence of these. In some cases one may see infected tegmen cells and evidence of infection of the bone of the tegmen. Occasionally one may see actual perforation of the tegmen.

Fistula.—In chronic suppuration of the middle ear, infection usually invades the internal ear through the apex of the external canal on the inner wall of the aditus. Occasionally this breach in the capsule of the external canal can be seen in the radiograms.

Zygomatic mastoiditis.—This condition, as its name denotes, may be met with when the mastoid is infected and pneumatization has extended forward into the root of the zygoma. In rare cases, these infected cells may rupture into, and destroy, the temporo-mandibular joint.

Apical petrositis.—Occasionally well-marked cell formation may be seen in the petrous bone, mesial to the labyrinth, the chain of cells sometimes extending even to the tip. When such cells become infected, the X-ray appearances are similar to those seen in the cells normally situated in the mastoid process. But in cases where the cells are small and few, all that may be discernible in the radiogram is a very faint blurring of the bony structure or there may be no visible X-ray change whatever.

The Post-Operative Mastoid

When the discharge persists for longer than the usual time after a mastoidectomy and no cause can be found for this persistence in the nasopharynx or elsewhere, an X-ray examination of the mastoid process may be required.

In such a case, a careful search should be made for infected unopened cells. The cells most easily "missed" at operation are those situated in the squamous portion of the temporal bone, in the tegmen antri, along the posterior meatal wall, backwards over the lateral sinus and forwards in the root of the zygoma. Stereoscopic views of all planes are often necessary in such cases, and sequestra should be carefully looked for.

Mr. E. Watson-Williams said that the ordinary plain or stereoscopic X-ray view of the mastoid was a subject which had long interested him. In 1924 he had begun systematically to have the mastoid radiographed, and he had found, as Dr. Graham Hodgson had done, great value in the regular use of X-rays in this region, particularly, of course, in anomalous cases. He did not use it as a routine—it was a matter of expense, as everyone knew. If it was obvious that there was an acute mastoid abscess which had to be opened, he did not, as a general rule, worry about having a radiogram taken. In the anomalous case, however, it was extremely valuable to have the help of X-rays. When he had begun to ask for X-ray pictures no great amount of information was available as to the best angle. He had realized from the beginning the importance of having a standard position for interpretation. The principal ray was 2 in. above and 1 in. behind the opposite external meatus and came out at the damaged external meatus. The advantage of this was that it made it comparatively easy to correlate what was seen in the X-ray film with what was found at operation. The line of sight was not quite the same as the view radiographically obtained, but they very nearly coincided, and the amount of tilt was sufficient to turn the other mastoid and the petrous bone well out of the way so that a good view was obtained of the tympanum, mastoid (antrum and cells), and adjacent bone.

It was still frequently implied, or even stated, that when there was an acute infection of the ear there would be an acute tympanitis, and that *later on* the mastoid would be invaded—as though there were a latent period, possibly of some days. That might occur as a rare thing, but as a rule, however early the acutely infected mastoid was X-rayed (even before perforation of the membrane had occurred) there was an obvious change in the antrum and a few of the cells. One

could watch the infection spread through the cellular mastoid, so that it might be two or three days, even in an acute infection, before the peripheral cells showed what could be described as definite change.

Dr. Graham Hodgson had made the point that absorption did not mean that the bone was destroyed; it meant only that it was decalcified. He had long used the description "flocculent appearances" for the stage between the first swelling of the mucous membrane and that which followed, in which cell outlines began to be demonstrably lacking.

Mr. I. A. Tumarkin said that Dr. Graham Hodgson drew a hard and fast line between cellular and acellular processes, but X-ray appearances did not fall into those two distinct groups. There was a mixed mastoid, neither cellular nor acellular. Lane and Porter, before the War, had drawn attention to the fact that there were two types of asymmetry: (1) An anatomical asymmetry and (2) a clinical asymmetry, in which there was a mixed type having a certain number of fairly developed cells. He imagined that this mixed type was a source of ambiguity.

Another source of ambiguity was in the use of the word "sclerotic". His own radiologist used the word to include first the acellular type of bone, which was just a mass of dense ivory-like bone, and secondly, the sclerosed mastoid which was of inflammatory origin, and said that he could distinguish between the two types. Was it really possible always to distinguish between the inflammatory sclerosed type of mastoid and the true ivory type, and if so, could we have some more clear-cut classification?

His experience was that in the chronic mastoid (he never X-rayed acute mastoid) the acellular type was the one almost invariably encountered, and he understood, from his radiologist, that this was not a sclerosed mastoid, but a true developmental type. It had been said that chronic mastoiditis was a condition which occurred in the acellular bone exclusively.

Dr. Graham Hodgson said that in fractures of the petrous bone planigraphy was very useful. In the ordinary X-ray picture the tube and film, as well as the patient, were fixed. In planigraphy the position was rather like that of the spokes and hub of a wheel. On the circumference of the wheel were the tube and the film, while the axis represented the patient. The axis remained fixed and the film and tube moved. In planigraphy of the heart, for example, a ghost picture of the sternum and of the backbone was obtained but, the axis going through the heart, a clear radiogram of that organ was presented. He had found this method useful in fractures of the petrous bone and in exostosis of the external meatus, but was a little doubtful as to its value in acute mastoid cases.

A Member asked what Dr. Graham Hodgson meant when he referred to a sclerotic mastoid as being "developmental". He presumed that he did not mean "congenital", but one in which there had been some inflammatory process. Or did he refer to two different types of mastoid, one congenital and the other developmental, meaning by the latter that the infection had begun after birth?

Dr. Gibier-Rambaud (in reply for Dr. Chaussé) said he admitted that it was difficult to interpret the radiograms rightly, and that was why several oto-radiologists, including the most eminent in Europe at the present time, were organizing an international association of radio-otologists. Dr. Graham Hodgson was one of the first members. Those joining this body would be not only good clinicians but good radiologists also. He spoke neither as a radiologist nor as an otologist, and he had found a considerable amount of difficulty at first in appreciating his friend's radiograms

and tomograms. Included in the association would be those who had elaborated these new methods, tomography, and so on. The object of the movement was to ensure that in future the otologist would know exactly with what he was dealing, and that his work would thus be very much easier.

In reply to a query as to whether the method of colouring one stereoscopic image red and the other green, and looking at it through red and green glasses had been applied to 3-dimensional radiography : To his knowledge this had never been done. He thought it would complicate the subject very much and interfere with the clearness of the half-tone image. The stroma would be scarcely visible.

Dr. Graham Hodgson (in reply) said that in early mastoiditis some haziness of the cells and mastoid antrum was to be observed. Mr. Tumarkin had mentioned the mixed type of mastoid ; this was quite common, and the radiographic appearance of the peri-antral cells was a great help.

He agreed that the expression " a sclerotic mastoid " was a misnomer. The " ivory " mastoid was an anatomical condition, not the result of infection, and when dealing with the infective condition he always used the word " sclerosing " or " sclerosis ".